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Turn Big Dreams into Fabulous Food

In springtime, our thoughts often turn to fresh strawberries, tomatoes, potatoes or just about anything else we imagine growing in our own backyards. This *Guide to Organic Gardening* will help you turn your garden dreams into the reality of fresh food on the table and preserved riches in your pantry.

The practical, well-researched articles in this collection were written by experts with decades of experience in their fields. It's designed for those who are new to gardening, though it also offers plenty of solid information for experienced gardeners eager to expand their knowledge base.

If ever there were a time to get started with a garden, it's now. Nearly every news cycle brings more appalling stories of pesticides in our food system, mistreatment of animals, and health-threatening breakdowns in the Big Ag/Big Food system. A conscientious consumer can be left wondering what, exactly, is safe to put on the dinner table. We have an answer: If *you* grew it organically, you can certainly depend on it.

Our guide covers the scope of organic gardening from the ground up. With "How to Compost" on Page 28, you can get started right now building a treasure trove that will not only reduce your footprint at the landfill, but will make you keenly aware of the elegance of natural processes. Leaves, grass clippings and that muck from the crisper drawer transmuted into black gold for the vegetable garden? What a miracle!

"Build Better Soil with Free Fertilizer" on Page 15 expands on this idea with specific directions about how to apply grass clippings, mulches and compost for your healthiest garden ever. The handy chart on Page 17 will help you save money on fertilizer by comparing prices of various options, from the free garden gold of grass

clippings to some outrageously overpriced commercial fertilizers.

"Seed Starting Made Simple" on Page 37 shows how to reduce expenses while also getting a jump on the warm months by starting seeds indoors. If your growing season is short, this strategy makes it possible to grow heat-loving crops, such as tomatoes, peppers and melons, while also cultivating cool-weather crops, such as broccoli, that need a little head start to be mature before winter comes calling. If your days are long and sunny, you may be able to reap two harvests by starting a second crop of seedlings indoors as the first crop finishes up in the garden. "Garden

Transplanting: Expert Advice" on Page 56 will give you the know-how to transition your seedlings safely when they're ready.

In "Top Gardening Challenges," Page 8, we share reader reports about trials they've endured and eventual solutions they've discovered as they've

grown food all over the country.

We provide what you'll need to know to grow some favorite garden crops, including basil, tomatoes, strawberries, potatoes, carrots and beans. In "4 Garden Plans for Kitchen Herbs" on Page 64, you'll find suggestions for growing those aromatic, flavorful plants that will help elevate your garden-fresh meals from day-to-day delicious to mouthwateringly special.

This *Guide to Organic Gardening* is just the beginning. Head on over to www.MotherEarthNews.com for our Amazin' Archive, featuring stories that date back to MOTHER's beginnings in 1970. Our website also provides information on our Facebook, Flickr and Pinterest pages that serve as focal points for a growing community of enthusiasts.

Whatever you cultivate this season, we wish you happy and productive gardening!

—MOTHER

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Lower Blood Pressure Naturally with Hibiscus Tea

Recent studies show hibiscus tea can lower blood pressure as effectively as some standard hypertension drugs. Hibiscus is widely consumed around the world as a ruby-colored, lemony beverage (it's the main ingredient in Red Zinger tea). Hibiscus is safe and, unlike most blood pressure drugs, rarely causes side effects. Plus, hibiscus plants can be grown in much of the United States, so you can actually grow your own blood pressure medicine.

Hibiscus (*Hibiscus sabdariffa*) has been used to treat high blood pressure in both African and Asian traditional medicine. In 1996, researchers in Nigeria confirmed this age-old wisdom by showing that hibiscus flowers reduced blood pressure in laboratory animals. Soon after, researchers in Iran showed the same

benefit in people. After measuring the blood pressure of 54 hypertensive adults, the researchers gave them 10 ounces of either black tea or hibiscus tea for 12 days. Average blood pressure decreased slightly in the black tea group, but decreased a significant 10 percent in the hibiscus group.

Since then, several additional studies have confirmed this effect, including two that tested hibiscus head-to-head against standard blood pressure medications:

- Scientists in Mexico gave 75 hypertensive adults either captopril (Capoten; 25 milligrams twice a day) or hibiscus tea (brewed from 10 grams of crushed dried flowers—about 5 teaspoons per 1 to 2 cups of water—once a day). After four weeks, the herb had worked as well as the drug, with both groups showing an 11 percent drop in blood pressure.
- In another study, the same researchers gave 193 people either lisinopril (Zestril, Prinivil; 10 milligrams) or hibiscus (250 milligrams in the form of a capsule) each day. After four weeks, the herb had worked almost as well as the drug: Blood pressure decreased 15 percent among those on the drug, and 12 percent among those taking hibiscus.

How does hibiscus lower blood pressure? Recent research suggests a combination of reasons: It has diuretic properties, it opens the arteries, and it appears to act as a natural angiotensin-converting enzyme (ACE) inhibitor, which means it slows the release of hormones that constrict blood vessels. In addition, hibiscus boosts immune function and provides valuable antioxidants.

Dose recommendations vary from about 1 teaspoon of dried “flowers” (technically, we’re referring to the calyxes surrounding the flowers) per cup of boiling water, up to the 5 teaspoons used in one of the Mexican studies. Steep for five to 10 minutes. If you have high blood pressure, you should own a home blood pressure monitor. Take readings before different doses and retest an hour later to see what works best for you. Check with your doctor prior to taking hibiscus if you’re currently on medication to lower blood pressure—often a combination of an herb and a lower dose of a pharmaceutical provides the same benefit.

As with all medications, allergic reactions or other side effects are possible. If you experience negative symptoms after ingesting hibiscus, stop taking it and talk to your doctor.

Hibiscus tea is a safe, effective and tasty way to manage high blood pressure.



Grow Your Own

Hibiscus is a perennial tropical plant, so you may think that growing it in the United States would be limited to the Sun Belt and Hawaii. Not so, says Ira Wallace, co-owner of Southern Exposure Seed Exchange in Mineral, Va. For U.S. growers, Wallace recommends the 'Thai Red Roselle' variety of hibiscus, which thrives as an annual as far north as New Jersey. This beautiful hibiscus has dark green leaves that develop red veins and undersides as they age. The stems and branches are also dark red. Wallace's plants in Virginia grow to 4 feet high and 3 feet wide.

In temperate zones, this variety of hibiscus should be started in pots at the same time you would start tomatoes. When seedlings are 3 to 4 inches high, transplant them to a sunny spot. Space plants 3 feet apart in rows 5 feet apart. This variety appreciates a soil rich in organic matter, but too much nitrogen will delay flowering until late in the season—possibly too late.



The calyxes surrounding hibiscus flowers pack a blood pressure-lowering punch. And you can grow them yourself!

At Wallace's farm in central Virginia, 'Thai Red Roselle' begins to flower in late July to mid-August, and continues until frost. Wallace covers plants with row covers during early light frosts, which allows for harvesting well into October.

Hibiscus calyxes are best harvested when they are fully grown but still tender. They can usually be snapped off by hand, but if stems have hardened, use clippers. Harvesting early and often increases production. On Wallace's farm, production ranges from 1 to 2 pounds of fresh calyxes per plant.

It takes 10 to 12 pounds of fresh calyxes to make 1 pound of dried calyxes for tea. For home gardeners, this means three to six plants should produce at least half a pound of dried calyxes for blood pressure-lowering tea, and lots of tender young leaves for a delicious addition to salads. Find more hibiscus growing advice from Wallace at <http://goo.gl/wM6BM>.

—Michael Castleman

You Can Help Save the Monarchs

How can one not be enthralled by a flutter of monarch butterflies landing in a hedgerow full of flowering milkweeds nestled on the edge of a farm or garden? But these butterflies' annual migration—one of the greatest spectacles in nature—has become an endangered phenomenon.

The number of monarchs reaching their overwintering grounds high in the oyamel fir forests of central Mexico has hit a record low. One of several factors that has contributed to the monarch's steep, decade-long population plummet is the loss of milkweeds—the monarch's host plant—as a result of herbicides used on fields of genetically modified crops. Some scientists suspect the largest contributor to the milkweed die-off is the herbicide glyphosate (the active ingredient in Monsanto's Roundup brand, among other products). This problem, along with drought and habitat lost to farmland, is a perfect storm of natural and human-caused factors that has spurred the loss of many milkweed species, numerous

monarch butterflies, and an estimated 130 other insects common to milkweed patches.

Milkweeds are the *only* host plants monarch caterpillars can eat, and monarch butterflies lay their eggs on the leaves. Without milkweeds, there are no monarchs—and throughout Midwestern

herbicides, or by employing minimal, targeted use of weedkillers.

Thousands of people participated in events to get Moving for Monarchs (M4M) in 2014. The M4M initiative hosted an event at the National Mall in Washington, D.C., in June 2014. At the event, colleges and garden clubs advocated for the recovery of monarchs and hosted workshops on how to grow milkweed. To learn more about the M4M initiative, you can go to www.MovingForMonarchs.org.

A valuable perk of monarch protection is that schoolchildren across North America will be able to continue to study and enjoy the stunning monarch migration.

You can join in: Grow native milkweeds in your garden (you can collect the fluffy seeds from

roadsides in fall), count caterpillars on milkweeds in or near your yard, record monarch migration dates, and turn the data you collect in to Monarch Watch at www.MonarchWatch.org.

—Gary P. Nabhan



Monarchs are disappearing, as are milkweeds, their host plants.

farmscapes, milkweeds declined by 58 percent from 1999 to 2010.

Fortunately, some farmers and gardeners have found ways to manage weeds and pests—as well as maintain soil tilth and pollinator abundance—without using

It's Time to Ban Dangerous Neonicotinoid Pesticides

Germany, France and Italy have banned a class of potent pesticides called “neonicotinoids.” Evidence linking these pesticides to the honeybee decline known as “colony collapse disorder” has been mounting. Now, new research suggests residues could be harmful to humans, yet these poisons are still in widespread use across the United States.

Named for their chemical structure, which is similar to that of nicotine, neonicotinoids are systemic pesticides, meaning they're in every part of a plant. Generally, seeds are coated in the pesticide before they're planted, and, as a plant develops, the chemicals move into the leaves, roots, pollen, nectar, and even the food products eventually made from the crop. If insects feed on any part of the plant—even water droplets released by plant leaves—the pesticide, a neurotoxin, kills them. In the case of honeybees, if the amount of pesticide ingested isn't strong enough to kill them, it can still cause impaired communication, disorientation, decreased life span, suppressed immunity and disruption of brood cycles.

Not only are neonicotinoid pesticides systemic, they're also extraordinarily persistent. Research shows these pesticides can persist in the soil for *more than a decade!* Neonicotinoids are widely used on corn, soy, canola, sugar beets, wheat, ornamentals and more. Some sources note that it's difficult for farmers to find corn seed that hasn't been treated with one of these insecticides. As industrial farmers use these potent pesticides year after year on the same land, it's creating an ever more toxic environment.

Neonicotinoid pesticides, produced by chemical giant Bayer, should have never been approved by the Environmental Protection Agency (EPA). One of the most commonly used neonicotinoids, clothianidin, went on the market in 2003 after being granted a “conditional registration” from the EPA. This is code for saying the EPA will allow the pesticide's use even though there's not enough evidence to show that it passes safety standards—a practice that, shockingly, occurs for about 70 percent of the active ingredients in pesticides that go through the review process. Leaked memos written by EPA scientists stated that what studies Bayer did submit were poorly run, and the scientists openly admitted that neonicotinoids pose harm to honeybees.

A new study from Harvard University scientists concludes that neonicotinoids are likely the primary cause of colony



collapse disorder. According to lead researcher Chensheng Lu, “It apparently doesn't take much of the pesticide to affect the bees. Our experiment included pesticide amounts below what is normally present in the environment.”

Numerous studies have shown that these pesticides are killing bees and many other non-target insects, and research now suggests danger for us, too. A 2004 German study tested samples of fruits and vegetables and found that 12 percent contained neonicotinoid residues. A 2012 Japanese study was the first to show that neonicotinoids affect brain development in mammals. The researchers warn that “detailed investigation of the neonicotinoids is needed to protect the health of human children.”

A lot is at stake here. Bayer will lose billions if the EPA does the right thing and bans neonicotinoids. However, bee populations are vital to agriculture, and farmers will lose billions if honeybee populations continue to plummet. And then there are our children ...

Beekeepers have teamed with the Pesticide Action Network to petition the EPA to suspend registration of neonicotinoids. Please join us in demanding that the EPA finally put a stop to the use of these potent chemicals in the United States. Go to <http://goo.gl/py3LC> to learn more about the issues surrounding neonicotinoids. It's time for the government to stand up and protect *us*, not the chemical companies.

—Shelley Stonebrook

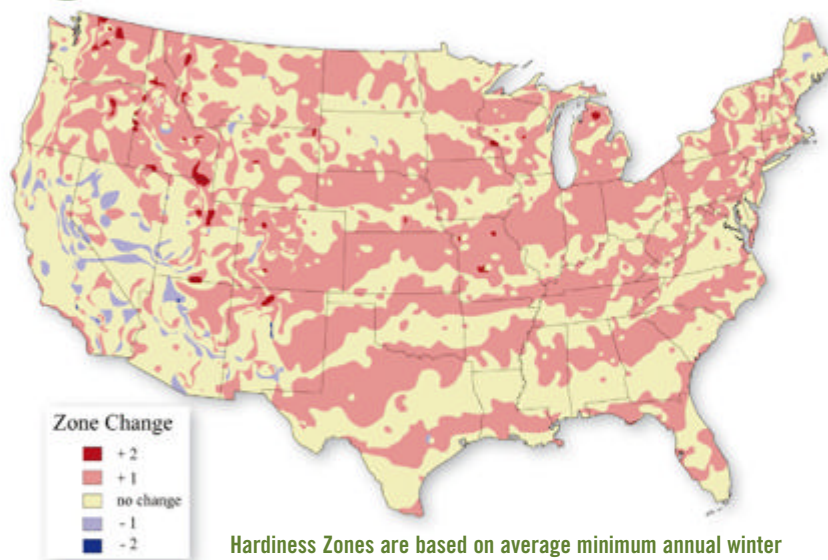
Climate Change and Your Garden

Political scientists sometimes characterize the United States as a closely fought battle between red and blue. While the political battle is undecided, from a climatologist's perspective, a different kind of red is clearly winning. And to gardeners, this means big changes.

The map at right, from The Arbor Day Foundation, shows changes in USDA Hardiness Zones from 1990 to 2006. While a few pockets of gardeners have seen their Zones shift to cooler temperatures, the majority of the country has seen its Zones move into the red because of warmer temperatures.

Although these changes are significant, talking about them strictly in terms of global warming is a simplification. Garden writer Anne Raver of *The New York Times* was among the first to label the trend "global weirding." Nearly all parts of the country have been experiencing strange and often extreme conditions, whether hot, cold, wet or dry.

Opportunistic gardeners may be tempted to fantasize about what a few



Hardiness Zones are based on average minimum annual winter temperatures. Since 1990, average temperatures have warmed, causing most Zones to shift northward.

extra degrees of warmth will do for their crops. Deep down, however, they know that Mother Nature is getting the mother of all makeovers, the results of which no one can accurately predict. It will take a coordinated effort to reduce and offset

global warming, and farmers and gardeners worldwide will need to expand their expertise as they endure more extreme weather. Learn more about your Zone at www.ArborDay.org/Media/Zones.cfm.

—Roger Doiron

Are These Seeds Still Good?

Many of us have unearthed seed packets from past seasons and wondered whether the seeds would still grow anything. Seed viability depends on the plant species and the seeds' storage conditions. Under ideal conditions—dry and dark, with a temperature at about 40 degrees Fahrenheit—some seeds will germinate well for five or more years. Other seeds' germination rates will drop off after only a year or two.

Iowa State University's Department of Horticulture gives the following average seed storage limits for common crops. Seeds aged past these limits will have lower germination rates, and plants that do sprout will grow with less vigor.

One year: onions

Two years: corn, peppers

Three years: beans, peas

Four years: beets, pumpkins, squash, tomatoes, watermelons

Five years: broccoli, cabbage, cucumbers, lettuce, cantaloupes, radishes, spinach

If your seeds were stored near or beyond their expected shelf life or in less-than-ideal conditions, you can gauge their viability by doing a simple test. Write the name of the variety on a paper towel with an indelible marker, and then moisten the

towel with water. Count out at least 20 old seeds of that variety onto the towel, roll up the towel, and place it in a plastic bag. Put the bag in a 70-degree location. Check daily for germination.

After some seeds have germinated and a week has passed without additional germination, compare the number of sprouted seeds with the number you started with. If the germination rate is 70 to 90 percent, you could use the seeds

and simply sow them more thickly. If germination is less than that, planting those seeds in your garden will most likely yield much less than if you had planted fresh seeds.

For more tips on testing seeds, watch "How to Check for Seed Viability" at <http://goo.gl/3iZMVj>.

—Vicki Mattern





TOP GARDENING CHALLENGES *and* *How to Overcome Them*

From rogue rabbits and 4-inch-long grasshoppers to clay soil and summer drought, veteran organic growers detail how they cope with vexing gardening problems.

By Barbara Pleasant

The perfect garden—free of all pests, weeds and weather surprises—does not exist. Nor does the perfect place to garden, because every climate is friendly to some crops and hostile to others. Thankfully, tackling gardening challenges, while frustrating at times, is part of what makes growing your own food such a lively adventure.

Smart garden troubleshooting is often crucial to successful food production, and working out the best solutions may require years of trial-and-error experimentation. To help you get a jump-start, we asked more than a dozen longtime or-

ganic gardeners to share their expertise on tactics for solving common organic vegetable gardening problems. Following is a roundup of their collective wisdom.

Critter and Pest Patrol

Dealing with insect pests, rabbits, deer, voles and other critters is perhaps one of the most frustrating and ubiquitous gardening challenges. Organic vegetable gardening can make this issue trickier in that you've wisely opted not to use harsh chemicals to keep such troubles at bay. In the case of critters, good fences can make for good harvests (and offer the kindest solution), and diligent monitoring for pests will prove well worth your time.



Address garden challenges as they come, such as putting down weed-barrier cloth to combat severe weed problems.

Irritating insects. An hour north of St. Louis, in New Douglas, Ill., Carol Lentz aims to check her plants for insect pests at least every other day. “Check the whole plant for signs of trouble, especially the leaf undersides,” she says. Squish any pest eggs you see, and handpick adult potato beetles, squash bugs and Mexican bean beetles and put them in a pail of soapy water to reduce their damage to plants and prevent a second (or third) generation.

Those darn rabbits. In Fargo, N.D., Joe Calvert says rabbits are second only to his short growing season on his list of gardening challenges. “Even in an urban environment, if you don’t have a fence around the garden, you may as well not even bother because the tender young plants are too tempting to rabbits,” he says. To keep rabbits out, add inexpensive poultry wire around at-risk beds or



Critters covet your fresh veggies. Control grasshoppers, such as eastern lubbers, with diligent handpicking, and keep out raccoons and other wildlife with secure wire fencing.



around the bottom of a perimeter fence. Bend 6 to 12 inches of the wire out from the bottom to fend off critters that may try to dig under the fence.

In the piney woods north of Covington, La., Carrie Lee Schwartz says containers are sometimes safer than an open garden. “I hang delicate crops, such as lettuce and strawberries, in planters on my porch to keep them close to the kitchen and away from rabbits,” she says.

Pesky groundhogs. When Tim and Mary Ann Kirby began gardening near Pittsburgh, Pa., they had a diligent guard dog that chased away wandering animals. “He has since died, and the critters have been a headache,” Mary Ann laments. “We have a good fence, but it’s not enough to keep out groundhogs and raccoons.” She says groundhogs were the more problematic of the duo, first devouring broccoli and then helping themselves to cantaloupe. In addition to having a guard dog around, a couple of strands of electric fencing low to the ground can help deter groundhogs. On many homesteads with big gardens, growers set up permanent post-and-wire fencing or rigid livestock panels, and then add poultry netting and electric fencing for further protection.

Grubbin’ grasshoppers. Grasshoppers can devastate organic gardens, particularly in areas with hot, dry weather. These long-legged leapers are especially damaging to lettuce, beans, corn, carrots, onions and cabbage-family crops grown for fall harvest. Among the best organic controls

for grasshoppers are excluding them via row covers or screen barriers (get free used screen material from hardware stores that repair damaged screens), and employing poultry to patrol garden areas and snatch up the grasshoppers as snacks.

Hundreds of grasshopper species live in North America, and you’ll be dealing with a particular type. Melody Gould has been gardening in the Tampa Bay area for more than 10 years, where eastern lubber grasshoppers are often a food-grower’s foe. For control, gather and drown the hoppers in a pail of soapy water when they’re still showing the black-and-yellow coloring of youth. Gould explains that if you don’t catch them when they’re little, the lubbers will grow into huge, 3- to 4-inch grasshoppers that can clear all of the vegetation off a full-sized tomato plant overnight.

Oh, deer. The drought that has caused northeast Texas and other areas to shrivel has led to desperate hunger among wild things. “The shortage of greenery for wildlife has caused our worst gardening problems ever,” says Carole Ramke, who has been gardening organically in Kilgore, Texas, for more than 20 years. She had to build chicken-wire cages around her sweet potatoes—*inside* the garden fence—to protect them from deer. The deer started eating things they’d never eaten before, such as okra, watermelon vines, green persimmons and whole limbs of fig trees. “Our smaller melons even had tooth marks from raccoons, coyotes and deer. We were finally able to put a stop to the



Fencing excludes small animals, including pets, and can pull double-duty as support for climbing plants.

damage by installing an economical double electric fence around the garden and orchard,” Ramke says.

In addition to fencing, consider trying a deer repellent. While no repellent, commercial or homemade, can provide total protection, some do work well. Researchers in Connecticut found that egg-based repellents and the commercial brands Bobbex and Hinder are your best bets. (Find out which deer repellents work best at <http://goo.gl/t2mCNY>.)

Weather Woes and Climate Complications

Chatting about weather isn’t just small talk when it comes to organic vegetable gardening. Weather can make or break a growing season or determine the success of certain crops, and a savvy gardener should eye the forecast and pay attention to overall climate trends. (Our *When to Plant* app, available at www.MotherEarthNews.com/When-To-Plant-App, includes links to long-term weather forecasts.) In Bath, Ohio, Pat Kennedy has spent decades learning and relearning that one can’t control the weather. “We recently had one of

the wettest years in Ohio history. But at least my garden wasn’t flooded, I didn’t feel an earthquake, and no tornadoes or hurricanes came through,” Kennedy says. “Some things grew, some didn’t. The melons had so little flavor that they ended up in the compost pile, but both the hot and sweet peppers made the best crop ever, and I actually had artichokes! Start each season prepared, flexible and hopeful, and remember that there is always next year.”

Soggy spring soil. Carol Lentz in southern Illinois says she’s had to delay spring planting of cool-weather vegetables because of waterlogged soil in April, the prime planting month in her region for beets, carrots, lettuce, peas, potatoes and cabbage-family crops. “We construct raised rows in fall, when the soil is warm and workable,” she says. After mixing 2 to 4 inches of compost into the soil, Lentz then rakes it into mounds about 12 inches high and 3 feet wide. “Placing leaves between the raised beds provides a walkway and is a good way to compost the leaves during winter,” she says. Raising your beds or rows in this way will help with soil drainage, and you can also use a broadfork

to loosen wet soil in early spring so it will dry and warm up faster.

Relentless rain. Catherine Miller-Smith, who lives in rainy Vancouver, British Columbia, says, “For the past several springs we’ve had record rainfall—like we don’t get enough already! Because of this problem, some seeds will simply rot in the ground, and replanting is the only solution.” If you’re facing persistent rains, she suggests planting three sowings to ensure good germination of sweet corn and any other crops proving troublesome to get growing.

Short springs. After growing veggies near Baltimore for more than 20 years, Barbara White says gardeners in her area should look for fast-maturing varieties of broccoli, lettuce, peas and other cool-season crops because spring turns to summer so quickly in her region. With lettuce and spinach, she suggests using a portable “salad table”—a simple table-type frame with a recessed top for holding soil (see photo on Page 11)—that can be moved to shade when the weather gets too warm. “I made my first salad table in 2005 after our local Master Gardener coordinator

TECHNIQUES!

For specific advice on many of the techniques in this article, such as indoor seed-starting and building healthy soil, browse our online Garden Know-How series, available at www.MotherEarthNews.com/Garden-Know-How.

taught a workshop,” White says. “They cost \$10 to \$15 to make, and even someone with little in the way of carpentry skills can do it. I had the local hardware store cut the wood and then went home with all the supplies and made my first salad table in about an hour.”

Bill Nunes of Gustine, Calif., says gardeners in the Central Valley need to take special care with peas because of short springs, but good returns will usually result from making more than one sowing and using more than one variety. This approach works with other crops, too. “Always hedge your bets, even with your favorite and most reliable varieties of peas, melons, tomatoes and garlic,” Nunes says.

Summer drought. Weather experts have warned gardeners in many regions of the country—especially Texas and Midwestern states—to expect more droughts in future years. Gardeners should consult their local extension services to get drought-tolerant crop and variety recommendations. (For a chart of several drought-resistant crop varieties, go to <http://goo.gl/rnGQZA>.) Water with a drip hose to make sure water reaches plants’ roots. Harvesting runoff water from buildings is another smart maneuver to consider. “I placed a row of rain barrels made from garbage cans behind a storage building,” says Carole Ramke of eastern Texas. “On my sewing machine, I made a cover for each can from a circle of fiberglass screen, with a casing and drawstring on the edge. The covers keep out leaves and even prevent mosquitoes.”

Near Northampton, Mass., Stephen Bond begins collecting rainwater from the roof of his garden shed in spring, specifically for application in the summer dry season when his community is under watering restrictions. “For more efficient watering, I also bury soaker hoses under my tomatoes and peppers so I can hook up my hose when the plants need water,” Bond says. “That way, I don’t lose nearly as much water to evaporation.”

Fleeting summers. In wind-swept Cortez, Colo., at 6,100 feet elevation, Fran Marciano says that starting seeds indoors is a priority as summer arrives late and doesn’t last long. “We can have snow



Where springs are short, grow greens in a “salad table” that you can move to a shady spot when hot weather arrives (top). Drip irrigation is especially apt for drought-prone regions (bottom).

or killing frost well into June, followed by many hot days in July and August,” Marciano says. “An early start indoors is essential to making the most of a short, quirky growing season.”

Soil and Weeds

Healthy soil rich with nutrients and organic matter from compost will go a long way toward thwarting all kinds of gardening challenges. Excellent soil leads to healthy, vigorous plants, and strong plants aren’t as likely to be attacked by pests and can often beat competition from weeds. (Plus, an oft-overlooked aspect of nutrient-rich soil is that it equates to more nutritious fruits and vegetables.) No matter your soil type, weeds are inevitable, but we dig Connecticut grower Michael

Brunetti’s positive spin on the challenge: “You’ll always have some weeds, but if you weed a little bit each day, you can stay on top of them. Just think of weeding as an enjoyable therapy that takes you away from the everyday busyness of life.”

Disappearing soil nutrients. Rainfall in excess of 50 inches per year will wash nutrients from the soil, but frequent infusions of organic matter will greatly improve soil’s ability to hang on to them. “A month or more before planting, dig up your garden and mix in some organic fertilizer and at least 2 inches of compost,” advises Ronald Weathersby, who keeps a 2,000-square-foot garden in saturated Leesville, La. If you live in a dry area, this is still sound advice because compost holds in soil moisture, too.



Give a big boost to soil health by growing a cover crop such as buckwheat (top). Garden netting held aloft with simple hoops is an effective way to protect crops from birds (bottom).

Low organic matter. Every plot has a different jumping-off point when it comes to soil quality. “Our soil is naturally alkaline and rich in minerals but low in organic matter, so it needs to be enriched with as much organic matter as possible,” says Teresa Ebie, who gardens just north of Taos, N.M., at 7,000 feet elevation. “Root crops and greens do exceptionally well here, so they are a good place to start if you’re a new gardener,” Ebie says. “After you gain experience and enrich the soil, you’ll be amazed at what you can grow. Last fall, we packed our root cellar with storage crops—more than 100 pounds of carrots, 75 pounds of potatoes, and smaller amounts of beets, turnips, onions, garlic and winter squash.”

Woeful weeds. Michael Brunette, a 30-year organic gardening veteran who lives

in New Hartford, Conn., recommends using permanent beds as a primary strategy against weeds. “I use permanent raised beds and never set foot in them,” he says. “I never let weeds in the paths go to seed, and I use various organic mulches to suppress weeds after the soil warms up.”

Another good strategy, this one courtesy of Bill Nunes in central California: If you can afford the time, sow cover crops before any food crops to build soil tilth and organic matter, and to control weeds. “Buckwheat is great here in summer, and winter rye, peas and fava beans work well in our mild winters to suppress winter annuals and grasses,” Nunes says. “Building the soil food web with cover crops will give you more disease-resistant vegetables.”

Red clay. Former Georgia extension horticulturalist Daryl Pulis has long ad-

vocated applying coarse organic matter, such as composted bark or wood chips, to boost the quality of red clay soil, which can prove impossible to dig to more than 10 inches deep. Lifelong organic gardener Joyce Reid of Carrollton, Ga., also advises any gardener to address the soil issue first, but she’s opted to modify her bed design as part of that plan: “My solution has been raised beds. Instead of trying to dig down, I went up. Still, the soil has to be reconditioned every year or it naturally becomes compacted.” (For more on building better soil, go to <http://goo.gl/25fp7h>.)

Timing and Season Extension

When it comes to gardening, timing varies not only among general regions but also within microclimates. As you come to understand your growing conditions better each year, you can hone in on the best schedule and even discover how to eat at least some food from your garden all year.

Targeted timing. In my southwest Virginia garden, I’ve found that the records I keep from year to year are among my most valuable gardening tools. Even with simple crops such as carrots, getting planting dates right is what makes the difference between a good crop yield and an outstanding one.

Filling up four seasons. Year-round growing isn’t difficult in many areas provided gardeners plan ahead to make the best, full use of the calendar. Gulf Coast gardener Ronald Weathersby takes full advantage of his area’s generous growing season. “You can start harvesting cool-season vegetables in April and May, harvest summer crops next, and then enjoy a third harvest season in fall and winter,” he says.

Season extension. Since they began homesteading in 1999 in Virgil, N.Y., Chris and Bob Applegate have steadily installed features that add months to their growing season, including two small greenhouses. “Our original, unheated greenhouse produces more than 10 months’ worth of produce, with arugula, spinach and parsley making it through even the worst winters,” Chris says, adding that the new greenhouse will provide food for their flock, too. “I have added kale, Chinese cabbage and collards to feed

the chickens throughout winter. We do all this with a limited income and a lot of sweat equity.”

Crop protection. Just north of Colorado Springs, Colo., Kay Fisher and her husband use plastic-covered hoop houses to extend their growing season. A bonus of their season-extension setup is that they can then cover the hoops with netting in summer to protect plants from pests. “We put rebar inside the edges of our raised beds, sticking up about a foot. Then we cut black flexible hose used for sprinkler systems to the appropriate lengths and slip the ends over the rebar to form hoops,” Fisher explains. “When plastic or row covers are no longer needed, we attach small bird netting to the hoops with zip ties along the bottom, leaving the ties a little loose so the netting can be moved up and down to access the beds for weeding and picking. The netting keeps out deer and most other pests, and it reduces damage from hail.”

Crop Considerations

You likely won't be able to grow *all* crops where you live. Some crops just won't do well in certain regions, at least not without a lot of extra care and attention. “My advice to new gardeners is to amend your soil well, no matter what you're growing, and sow crops that thrive in your climate,” says Dave Sexton, who has been gardening in Oregon's Willamette Valley for decades.

Growing tomatoes. In her rainy British Columbia climate, Catherine Miller-Smith says the best solution for overcoming the soggy soil and cool rains that delay tomato planting and promote late blight is to grow tomatoes in plastic-covered hoop houses. “My tomatoes have a roof over their heads. I install a head-high hoop house in spring, keeping the sides down. Then, I slowly lift the sides as the weather warms, until only the top of the hoop house is still intact,” she says. After cooler weather returns in fall, she begins rolling the plastic back down until it touches the ground again.



Use a broadfork to loosen compacted soil and, in rainy areas, to aerate soil so it dries out quicker for planting.

Cold-weather crops. Some crops are just plain miserable in heat. “We have a hard time growing cold-weather vegetables here in Tampa Bay,” says Florida gardener Melody Gould. “We could be sweating on a December day that reaches 90 degrees Fahrenheit, and then have lows drop to near freezing for a few days, followed by days when the temperature goes right back up to 90.” If you live in a hot, humid climate, Gould encourages you to stick with heat-tolerant crops, such as peppers, tomatoes, eggplants and others with tropical ancestry.

Cool, cloudy climates. Oregonians are no strangers to gray days, but many crops thrive there. “Cool-season greens and cole crops are easy and do well most of the year here. Many perennials, such as raspberries and artichokes, do well because of our mild winters, and potatoes and blueberries love the acidic soil,” says Dave Sexton. Garlic and leeks are easy in the Northwest, too, but Sexton explains that tomatoes really thrive only if you plant stout seedlings that were started very early indoors, insulate the soil with mulch, and protect

the plants with cloches during the beginning of the season.

You Can Do It!

Growing your own food using organic methods is one of the single best things you can do for the health of you, your family and our environment. Plus, there's nothing like toting a heaping garden harvest into your kitchen to give you that one-of-a-kind satisfaction that comes from self-reliance. So, no matter what gardening challenges crop up for you, don't be tempted to throw up your arms in defeat. The most advanced gardeners—and even farmers who have been at the task for decades—will tell you they never stop learning.

On your path to success, note what doesn't work for you and try new methods, crops and varieties every year. Talk to other gardeners, because if you're experiencing a challenge, you're likely not alone. (An easy way to connect with other gardeners in your vicinity is via our new state and province Facebook pages. Find yours at www.MotherEarthNews.com/Facebook.) Today, you may be the one asking most of the questions, but 10 or 20 years down the road, you may be the sage mentor talking over the fence with a newbie gardener, sharing what you've learned along the way. In this sense, “challenges” aren't just troublesome annoyances—they're opportunities to meet your neighbors and add to your bank of gardening know-how. 🌱

MOTHER's gardening guru Barbara Pleasant has been teaching us how to grow fruits and vegetables organically for 30 years. Whether dealing with too much wind in winter or potato-eating voles in summer, she greets gardening challenges with inquisitive optimism in her Virginia garden. Her website is www.BarbaraPleasant.com.



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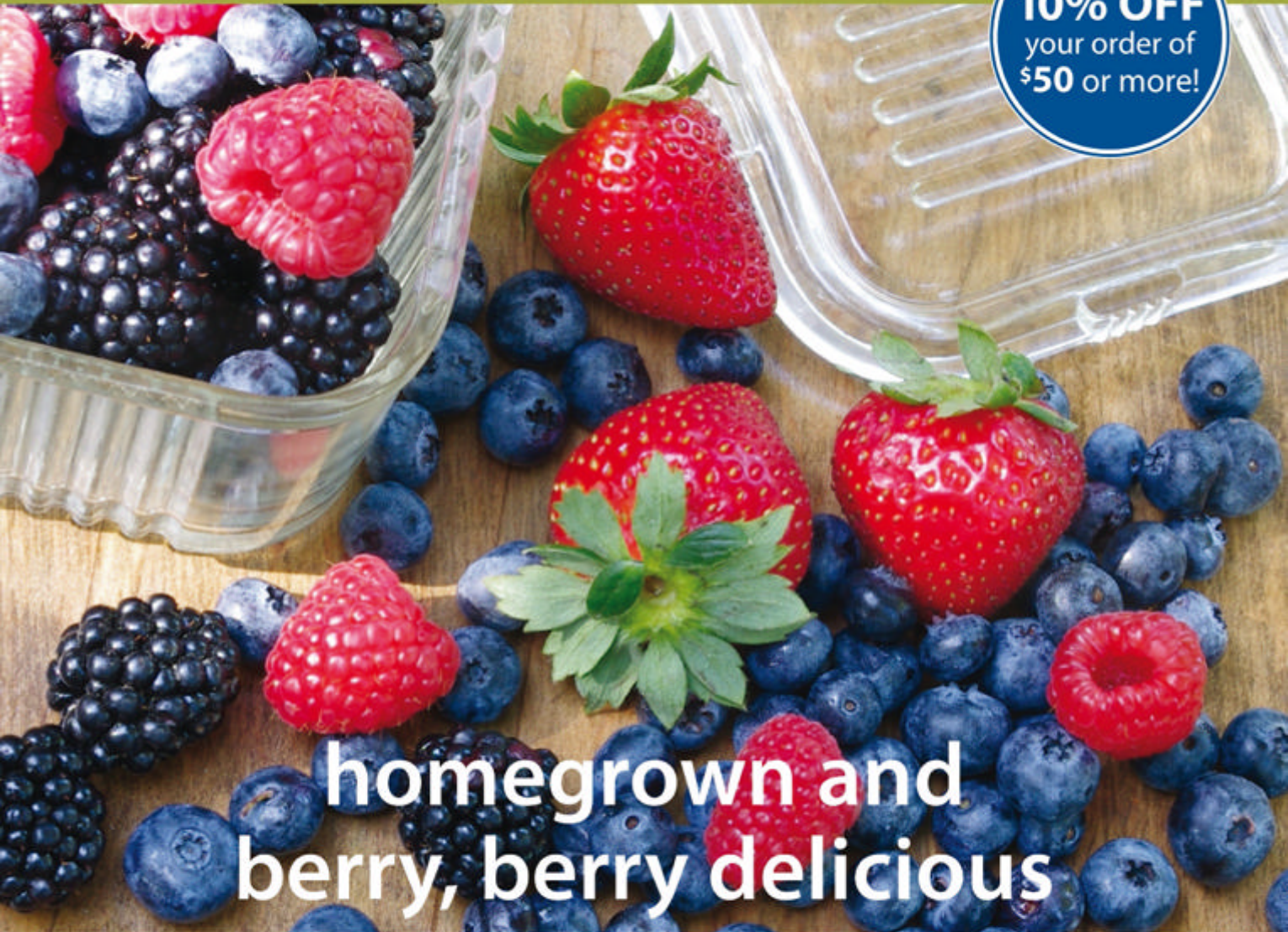
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Build Better Soil with **FREE ORGANIC FERTILIZER**

Avoid expensive fertilizers — here are your best organic options, including two that you won't even have to pay for!

By Cheryl Long
and Barbara Pleasant

As more people recognize the many benefits of organic gardening methods, a fresh crop of organic fertilizers is sprouting on store shelves. Many are overpriced, and some are stunning rip-offs that reputable stores and catalogs should be ashamed to sell (see “How to Compare Fertilizer Prices” on Page 17).

The really amazing thing is that two of the best organic fertilizers are easily available to most of us *absolutely free*! Here's

how to avoid the scams and find the best buys for a healthy and bountiful harvest.

The Best Free Fertilizers

Products labeled as “fertilizer” must be labeled with their content of the three major plant nutrients—nitrogen, phosphorus and potassium (N-P-K). Most organic fertilizers are bulkier than synthetic chemical products, so their N-P-K percentages are typically lower than those of synthetic products, and their application rates are higher. Also, because organic products are biologically active, their N-P-K numbers

may change somewhat from batch to batch and over time. Because of this, it can be hard for producers to comply with the labeling laws. As a result, some excellent organic fertilizer options, such as compost, are often not even labeled as a “fertilizer.” One of the best free fertilizers, grass clippings, breaks down so quickly that it can't be bagged and sold.

But make no mistake, compost and grass clippings do what fertilizers are supposed to do: They enrich the soil with nutrients that plants and microscopic soil life-forms are eager to use. In most areas,

you can easily collect bagged grass clippings from your neighborhood that are set out and ready to pick up. And many communities make commercial compost from collected yard waste (made mainly from grass clippings and leaves) available free.

So, if you can get free clippings or compost, how much should you use? Here are some guidelines prepared with help from soil scientists at Woods End Laboratories in Maine.

Grass Clippings: Just Half an Inch Will Do!

Grass clippings are one of the best organic fertilizers. You can find free local sources, and the clippings do double-duty preventing weeds and conserving soil moisture when used as mulch—two things most other fertilizers cannot do. The nitrogen content of clippings will vary, with fresh grass collected in spring from fertilized lawns topping 5 percent nitrogen, while clippings from later in the year or from unfertilized lawns will likely contain about 2 to 3 percent nitrogen. (Avoid clippings from those “perfect” lawns that have been treated with herbicides.)

In most regions just a half-inch of fresh clippings each spring—that’s about six 5-gallon buckets per 100 square feet—mixed into the soil, or a 1- to 2-inch layer used as a surface mulch, will



provide all the nutrients most crops need for a full season of growth.

Get Compost: More Is Better

You can make compost from your yard, garden and kitchen wastes, but if you have a large garden, you’ll probably want more compost than you can make from your own yard. Many communities offer free yard waste compost, or you can find compost made locally at www.LocalHarvest.org (for more specific advice about composting, check out “Home Composting Made Easy,” at <http://goo.gl/Z4tQv>).

Compost is a bulky fertilizer that typically contains about 1 percent nitrogen (composted manure is closer to 3 percent

Compost is a great fertilizer. You can give plants an extra boost as they’re growing by applying the compost as a “side dressing.”

nitrogen), but one of its advantages is that it releases nutrients slowly, over a period of years rather than weeks or months. All the while, many strains of fungi and bacteria introduced to the soil from the compost form partnerships with plant roots, helping them absorb or actually manufacture more nitrogen, phosphorus and other nutrients. Compost also helps soil hold more moisture.

Each time a crop is finished, spread a half-inch layer of compost over the soil. Twice that much is better, but even a scant quarter-inch blanket of compost will help maintain your soil’s fertility.

Mulches and Cover Crops

The soil’s ability to hold on to nutrients increases as your soil’s organic matter content increases. Organic matter also plays a role in suppressing soilborne diseases while helping to retain soil moisture. Using mulches of shredded leaves, old hay or grass clippings will help boost your soil’s organic matter content as the mulches slowly decompose into compost. Cover crops planted during periods when you are not growing food crops also help increase the soil’s fertility.





Grass Clippings
FREE!



Alfalfa Meal
\$17/lb of Nitrogen



Fish Emulsion Fertilizer
\$112/lb of Nitrogen



TerraCycle Tomato Food
\$14,000/lb of Nitrogen

How to Compare Fertilizer Prices

Nitrogen (N) is the major nutrient that is most likely to become deficient in garden soils, so you can use it to compare fertilizer prices. If you're not careful, you could pay five, 10 or 4,000 times more than necessary to get the nitrogen and other nutrients you need. Blended fertilizers made from seed meals, manure and other ingredients (sometimes Certified Organic and sometimes not) tend to cost more than soy or alfalfa meal sold at farm supply stores. Also, dry or blended fertilizers are almost always a much better buy per pound of nitrogen than liquid products.

Don't get ripped off—you can put various products to the test by using this simple equation:

1. Multiply the retail price, let's say \$8.95, by 100, which gives you 895.
2. Multiply the weight of the package, say 10 pounds, by the percentage of nitrogen (often about 5 percent), which gives you 50. The percentage of nitrogen is the first number in the product's "guaranteed analysis." For example, the "5" in "5-3-2."
3. Divide the first number (price X 100 = 895) by the second one (weight X percent nitrogen = 50). This is the cost per pound—\$17.90—of the nitrogen in the fertilizer.

The charts to the right show the price per pound of nitrogen (N) for 19 fertilizers. It's definitely a buyer-beware world out there.

Dry Fertilizers *I = Industrial; O = Certified Organic (2015 prices)*

Product and N-P-K Analysis	Retail Price	Nitrogen Cost Per Pound
Grass (3-.4-2)	Free	\$0
Cottonseed Meal (6-1-1)	\$24/50 lbs (I) N/A (O)	\$8 N/A
Alfalfa Meal (3-2-2)	N/A (I) \$25/50 lbs (O)	N/A \$17
Soybean Meal (7-2-1)	\$22/50 lbs (I) \$70/40 lbs (O)	\$6 \$25

Blended Fertilizers

Phyta-Grow Pre-Plant Plus (7-5-7)	\$50/50 lbs (O)	\$14
Pro-Gro Organic (5-3-4)	\$22/25 lbs (O)	\$18
Black Hen (2-3-2)	\$8/20 lbs (I)	\$20
Fertrell Lawn and Garden (3-2-3)	\$35/50 lbs (I)	\$23
Dr. Earth Life All Purpose (5-5-5)	\$65/40 lbs (O)	\$33
Peace of Mind All-Purpose (5-5-5)	\$11/4 lbs (I)	\$55
Espoma Garden-Tone (3-4-4)	\$9/4 lbs (I)	\$75
Bradfield Tasty Tomato (3-3-3)	\$14/5 lbs (I)	\$93
Worm Power (1.5-.07-1.5)	\$16/3 lbs (O)	\$356

Liquid Fertilizers *Weights estimated based on a density of 10 lbs/gal*

Product and N-P-K Analysis	Retail Price	Nitrogen Cost Per Pound
Age Old Organics Grow (12-6-6)	\$18/32 fl oz	\$60
Maxicrop (5-1-1)	\$14/32 fl oz	\$112
Ferti-lome Fish Emulsion (5-1-1)	\$14/32 fl oz	\$112
FoxFarm Grow Big (6-4-4)	\$20/32 fl oz	\$133
Earth Juice Grow (2-1-1)	\$14/32 fl oz	\$280
TerraCycle Tomato Food (.02-.002-.02)	\$7/32 fl oz	\$14,000



For a great low-cost fertilizer, try cover crops. Instead of leaving soil bare part of the year, sow a nitrogen-fixing crop, such as vetch (above), crimson clover (top left) or red clover (left). A loose, fertile soil is the best medium for tender seedlings (below).



After three years of regularly adding compost and mulches, the soil's organic matter content will increase by several percentage points. Just 3 percent organic matter translates to a nitrogen-holding capacity of more than 3 pounds of nitrogen per 100 square feet. About 15 percent of that nitrogen (about 0.4 pounds) is available to plants in any given year because it is released slowly, as the organic matter decomposes. Use nitrogen-rich grass clippings as mulch, and you'll have plenty of available nitrogen and other nutrients to meet the needs of most garden crops!

When to Add Extra

A survey of soil-testing labs across the United States revealed that garden soils have *too much* fertilizer more often than too little. Adding too much can be just as bad for your crops as not applying enough. (A soil test every few years is a good idea.) If you apply grass clippings and/or compost according to the guidelines previously mentioned, you will only need to use more concentrated—and costly—organic fertilizers in a few special circumstances. When you start with a balanced soil (a soil test will tell you this) and apply grass clippings, compost and mulches regularly, necessary nutrients will usually be replenished in the correct proportions.

If fertilizers sold in bags or bottles are easier for you to use than grass clippings or compost, nitrogen is the nutrient to use to guide your application rate, because it is the nutrient most likely to be depleted as you harvest your crops each season. Plants need the right amount of nitrogen to grow new stems, leaves and other parts. If they don't get enough, they stay small and spindly, and never come close to their productive potential. If they get too much, they grow into huge plants that produce way behind schedule.

To complicate matters, if your soil doesn't get regular additions of compost or organic mulches, it will have trouble holding on to the nitrogen you add. Nitrogen is a slippery nutrient, prone to volatilizing into thin air or washing away (that's one of the reasons organic matter that holds nitrogen is so helpful). For most crops, you should replenish nitrogen to the tune of about one-third pound per

100 square feet of growing space each season. See the chart, “How to Compare Fertilizer Prices,” on Page 17 to find the best buys.

There are also some situations when even gardens with high levels of soil organic matter may benefit from supplemental fertilizing. Usually the reasons have to do with time and temperature.

In spring and fall, if soil temperatures are low, the biological processes that release nutrients from organic matter slow to a crawl. A fertilizer that quickly releases nitrogen (such as fish emulsion or blood meal) helps support strong, early growth of hungry cool-weather crops. Before planting big brassicas, such as broccoli, cabbage or kale, and to help spring peas get off to a strong start, mix a half-ration of one of these products into the soil before planting.

Tomatoes, peppers and other crops that stay in the ground all summer sometimes exhaust the soil’s supply of available nutrients by midsummer, the time they need it most. When the plants load up with fruit, you can prevent temporary shortfalls by mixing a light application of fertilizer into the top inch of soil over the plants’ root zones, topped off by a fresh helping of grass clippings for mulch. This “side-dressing” of fertilizer and mulch work together to keep the plants productive longer.

Seedlings started indoors often benefit from light feeding starting two to three weeks after the seeds sprout. By then, they have used up food reserves provided by the seed, yet they are not free to forage for nutrients beyond the confines of their containers. A half-ration of fish-based fertilizer mixed into room-temperature water will help satisfy their nutrient needs until they are ready to be transplanted outdoors. You can also use a drenching of fish fertilizer to help wake up

Flavorful vegetables grow best when their nutritional needs are met by the fertile soil they’re grown in.



A mulch of grass clippings, straw or leaves helps suppress weeds and also feeds the soil as the organic materials slowly break down.

once a year made it possible to reduce the fertilizer sweet corn needed by half.

Weigh Your Options

If you decide to purchase an organic fertilizer, use the chart on Page 17 to estimate how much nitrogen you are getting for your money, keeping in mind that the best deals come in big

packages. Peaceful Valley Farm Supply (www.GrowOrganic.com) is a great source for many kinds of fertilizers.

Manure-based products are usually composted or processed to reduce odors, and you can often find high-quality manure-based fertilizers produced in your area that don’t carry environmental baggage from long-distance shipping.

You can fertilize your garden with alfalfa, soy, cottonseed or another plant meal by itself, or use a blended meal-based product. Meal-based fertilizers often include 12 or more ingredients to balance fast-release nitrogen sources, such as meat, fish, alfalfa or cottonseed meal, with other minerals and micronutrients. These fertilizers are often less bulky compared with manure-based products, and most provide a broad array of nutrients.

Finally, we must mention products that have been dressed up with microbes, enzymes, humic acids and other substances. These extras might be helpful if you are trying to bring dead soil to life, but in a

garden that is well-nourished with compost and organic mulches, they are a waste of time and money. Microbes come free in compost, and earthworms never charge a cent for producing enzymes and humic acids. The diverse soil life beneath your feet produces everything your crops need; all you need to do is feed it what it wants: a steady diet of organic matter. 🌱



A photograph of a person with curly hair, wearing an orange t-shirt and dark pants, kneeling inside a greenhouse. They are tending to a row of green plants, possibly leafy greens, which are growing in a raised bed. The greenhouse is covered with clear plastic sheeting, and the structure is supported by metal poles. The lighting is bright, suggesting daytime.

Grow More Food in a MOVABLE GREENHOUSE

Boost productivity in spring, summer, fall and winter with a do-it-yourself greenhouse you can transport around your plot.

By Barbara Damrosch
and Eliot Coleman

Many gardeners use cold frames and quick hoops to extend the growing season. But just beyond these options is a step we think is simple and super-productive for the home gardener: a small, low-cost, portable greenhouse. At first, this may seem like a big step. We've found, however, that you can build a 10-by-12-foot greenhouse for less than you'd spend on a store-bought 4-by-4-foot cold frame. Our goals in designing this movable greenhouse were that it be simple to build with off-the-shelf parts, inexpensive and easy to move and anchor.

Even gardeners in moderate or warm climates can benefit from a greenhouse, which gives you much more variety in your winter fare, wherever you live, and also makes the experience of growing it more pleasant. Like the cold frame and the quick hoop, the greenhouse furnishes a warm and sheltered spot for plants, but because you can stand up inside, it also shelters *you*. Just think about heading out

with your harvest basket in hand, even while there's fresh snow falling.

Similar to a cold frame, a simple greenhouse captures the sun's heat and eliminates the drying, chilling effects of wind. Often a gardener's first thought will be: "Wouldn't it be nice to grow warm-weather crops, such as tomatoes, during winter?" But that would mean providing some sort of artificial heat, and suddenly the simple greenhouse becomes a big expense. Here's the great part: You don't need to heat your greenhouse in winter if you plant hardy crops that are most content growing in cool weather. Come spring, you'll get in those early crops even sooner than normal, and you'll transplant your warm-weather tomatoes earlier in the year. Then, sit back to wait for extra-early ripening—all this with no artificial heating required.

The Greenhouse Structure

The frame of a non-glass greenhouse—the structural surface against which the plastic covering rests—can be made of a far wider range of materials than the frame of a glass greenhouse can be. We've seen them made of bowed saplings from the woods or curved sections of concrete-reinforcing wire panels. We've seen greenhouses made with a few leaning poles holding the plastic sheet out from the south wall of a building. All these simple structures shelter plants well and show the creativity gardeners employ to be able to grow food all year.

In the standard commercial greenhouse, bowed metal hoops forming a pipe frame support the plastic sheet. This is what the phrase "hoop house" describes, and it's the style on which we modeled our greenhouse. But we've added a trick to make it even more productive: It moves!

A Movable Greenhouse

The ability to move a greenhouse from one place to another will ease the seasonal transition from winter to summer and back to winter for all the crops covered by the greenhouse. You can leave it over summer crops, such as tomatoes, peppers and basil, to safeguard them from fall frosts and keep them producing longer. Then you can move the greenhouse to protect cold-hardy crops that you've



This portable greenhouse design has door flaps you can open for ventilation on sunny winter days.

planted nearby so you can enjoy them well into winter. Such crops don't mind early frosts—in fact, they prefer to grow in the increasingly cool days of fall.

If a greenhouse can be moved to where you want it, when you want it, a whole new world opens up. You get the positives of greenhouse growing—namely, cold protection—while eliminating the negatives, such as the pest and disease buildup that can occur in soil that's continuously covered. In addition, you increase the number of crops that can be sheltered by one greenhouse by covering plants only when they need protection.

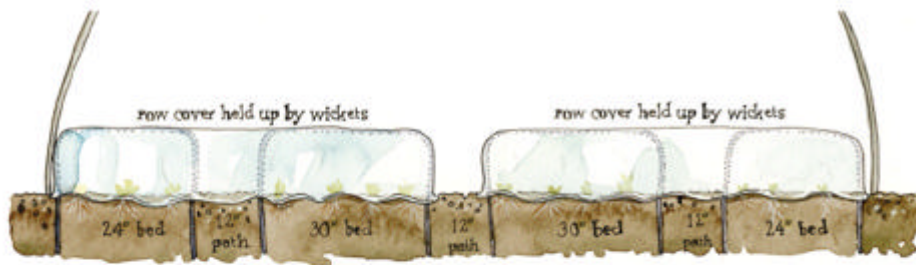
All that's required to make a greenhouse mobile is a slight modification to its construction. Normally, standard pipe

frame, plastic-covered greenhouses stand on a foundation of pipes driven into the ground. The far more expensive glass ones are usually erected on a concrete foundation. Ours is firmly attached to the ground when it's in place, but it can be detached for moving and then anchored again in a new location.

A greenhouse large enough to make a significant contribution to supplying your family with homegrown food year-round should be at least 10 by 12 feet. Our basic greenhouse is just that size, and builders can double or even triple the length by adding on modules of the same size. (For detailed building instructions, go to <http://goo.gl/S5XWeM>.) The frame consists of three half-circles of metal pipe



Get movin'! At 100 pounds total, the greenhouse can be picked up and relocated by two people.



Grow even more crops by using row covers as a second layer of protection inside your greenhouse.

attached to structural cross-pieces. A 10-foot length of pipe bends easily into a quarter-circle, and two of them form a half-circle hoop. We bend them the same way we bend our quick hoops, but we use a bender designed for high tunnels instead of low ones. (Find hoop-bending forms through Johnny's Selected Seeds; www.JohnnySeeds.com.) For pipe, we prefer the 10-foot-long and 1-inch-diameter pipes used for electrical conduit (called "1-inch EMT," which stands for "electrical metallic tubing"). They are available in the electrical department of your local home-improvement store.

For the foundation of the greenhouse, instead of inserting the bottom end of the hoops into larger-diameter pipes driven into the ground, as is done with standard hoop houses, we attach the bottom of the hoops perpendicularly to a length of 1-inch EMT lying horizontally on the ground. With this setup, all parts of the 10-by-12-foot greenhouse module are connected as a single unit rather than hav-

ing each rib individually attached to its own ground post. The greenhouse is thus a metal-pipe, plastic-covered bird cage that can be picked up and transported to wherever you want it.

After the greenhouse is in place, we attach it to anchors to hold it there (they're easily detached for moving). The corner anchors consist of four lengths of top-rail pipe, each 2½ feet long. One is driven into the ground at each corner of the greenhouse, and each is attached to a U-bolt that secures to the base connectors. We keep the plastic cover in place with form-fitting plastic clips that hold well, even in wind. All of this works smoothly and keeps the price low.

The weight of the pipes, the connecting parts and the plastic for this portable greenhouse add up to about 100 pounds. Thus the "pick up and move" part is doable for two reasonably fit and able-bodied gardeners. The two of us have moved this greenhouse many times with no problems, and because the structure isn't so

heavy that it has to be dragged into place, you can put it on any site, no matter how distant from the greenhouse's original position. If that seems beyond you, find some extra helpers on moving day.

Ideas for Every Season

This greenhouse design accommodates plants grown directly in the ground—not plants cultivated on the waist-high benches some hobby greenhouses feature.

The winter inhabitants of your greenhouse will be cold-hardy crops. Plenty of vegetables can withstand cold weather, and some actually taste better because of it. A few frosts have a way of sweetening leaf crops and root crops. Over the years, we've experimented with some 30 different vegetables in our winter garden, including arugula, beet greens, carrots, chard, chicory, claytonia, collards, kale, kohlrabi, leeks, lettuce, mâche, mizuna, mustard greens, parsley, radicchio, radish, scallions, sorrel, spinach, tatsoi and turnips. (For specific variety recommendations for several of these crops, go to <http://goo.gl/ha7KZA>.) They've all been successful to some degree, and the favorites in our household are spinach, carrots, tatsoi, chard and kale.

In most of the country, these crops are harvestable through winter as long as they have the minimum amount of protection



Grow fall greens outdoors and move the greenhouse over them when winter sets in.

from the outdoor weather that a single layer of plastic can give them. Here in Maine, we usually move the greenhouse over the winter crops about mid-October and plan to start eating those crops about mid-November.

In a cold climate such as ours, a second layer of protection inside the greenhouse will increase the value. We've kept temperature records for years, and here on the Maine coast, our portable greenhouse alone creates a winter climate akin to that of New Jersey, and the second inner layer magically transports the area under it to Georgia. If it's 15 below zero outside in Maine, it's 18 degrees Fahrenheit under the greenhouse's inner layer, and the cold-hardy winter crops don't mind that at all.

Your greenhouse can also help you transition from winter to spring. After our winter spinach begins to go to seed in spring, for example, we can clear the bed, add more compost, and replant it with early tomatoes. Thus, tomatoes get going about six weeks before our last spring frost date, because the double layer of protection keeps them from freezing.

Our summer crops will have a great head start, and in this temperate climate, they will keep producing all summer as long as the greenhouse is well-vented. The doors at either end allow for complete air flow if tied in the fully open position. If you live where summers get quite hot—too hot for even a well-vented greenhouse—you have other options. For one, you can uncover the greenhouse by taking off the plastic after it has given the early crops a jump-start, but before they're going to bake in there. If you prefer to leave the greenhouse covered, you can add a layer of shade cloth over the plastic to decrease the heat buildup. A 40 percent shade cloth made of a reflective material is a good bet for the backyard greenhouse. Or, you can always move the greenhouse out of the garden for a few weeks, until you're ready to put it to use again.

If you'd rather have more instant gratification in spring from salad-type vegetables as opposed to waiting for tomatoes, peppers and the like to mature, another winter-into-spring planting scheme could be the following: Plant patches of beets, carrots and spinach along with a bed of



The treasures a greenhouse can bring (clockwise from top left): early-ripening tomatoes, tender new potatoes in spring, and sweet, crisp root crops, such as carrots and parsnips.

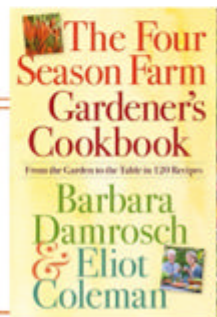
potatoes (early baby new potatoes are a fine greenhouse treat). Plant lettuce along with a few scallions at one end. The beets, carrots, lettuce, scallions and spinach can be planted anytime in spring, as soon as the space can be cleared from your winter crops. We plant our early potatoes on March 15; 'Rose Gold' is our favorite variety for early greenhouse production. Of course, you could always have all of these in addition to the early tomatoes, etc., if you build a second greenhouse. We're betting you probably will.

Another summer option for your greenhouse is to trap heat and use that heat to your advantage to prevent future weeds and pests in a process called "solarization." To do so, clean out all the early green-

house crops after the outdoor garden has started producing. Irrigate the greenhouse soil thoroughly, lay a sheet of clear plastic over the soil inside, and shut the doors. Those two layers of plastic (the greenhouse itself and the plastic over the soil) will trap enough of the summer sun's heat to kill weed seeds and plant disease organisms down to 4 inches deep in the soil.

To get step-by-step instructions for building this portable greenhouse, go to <http://goo.gl/S5XWeM>. Although we've been using these techniques for 30 years, the thrill has never worn off. We're still as delighted as children by the wide range of crops we can harvest daily from our greenhouse garden.

Barbara Damrosch and Eliot Coleman are two of the country's foremost authorities on organic gardening and winter growing. This article was adapted from their latest book, *The Four Season Farm Gardener's Cookbook*. Go to www.MotherEarthNews.com/Shopping to order this resource that's brimming with growing advice and recipes.



Use Cold Frames to GROW MORE FOOD

Sow seeds in simple frames to add more than a month to your spring garden season.

By Barbara Pleasant
Illustrations by Elayne Sears

Gardening expert Eliot Coleman asserts that “the basic cold frame is the most dependable, least-exploited aid for the four-season harvest.” I couldn’t agree more. The winter I built my humble frame of 2-by-4s topped with an old shower door, I gained a month at the front end of salad season. The best part was being able to sow some of my spring seeds directly in the frame. This made more space available under lights indoors for tomatoes and other crops that don’t like chilly conditions, and eliminated the hassle and setbacks involved with hardening off seedlings and then transplanting them. Best of all, seedlings got a head start in real sun, so they never got stretched out and leggy as they often do when started indoors. (Indoor grow lights are vastly less intense than real sunlight.)

What can you sow in a cold frame? In spring you get a boost with virtually any crop by sowing in frames. The list of “Top 12 Winter Cold Frame Crops” (below) can get you started, and as days get longer and warmer in spring, you can try your hand at framing up peas, bulb onions, potatoes or even tomatoes. When a cold frame is no longer needed for a crop that is up and growing, simply move it to a new location and plant more seeds.

Traditionally, gardeners have used cold frames to harden off seedlings started indoors, but you also can use a cold frame to winter-sow onions, cabbage or other hardy crops that are easily lifted and transplanted into rows.

A cold frame can be a wood box with a recycled window (or shower door) for the top or a hay bale enclosure covered with plastic. You might build one with bricks or concrete blocks and top it with translucent corrugated fiberglass (see “Anatomy of a Cold Frame,” Page 26). Your frames need not be all alike, though having two of the same size makes it possible to stack them for added height. I like frames I can move

around by myself without straining, so size and weight are important considerations. If you live north of Zone 6, you may want to create frames that are large enough to accommodate black, water-filled containers for solar heat storage, and insulate the sides by adding a snug berm of soil or mulch. In climates with chronic winter cloud cover, you can maximize available light by painting the interior walls of your frames bright white, or by covering the walls with heavy-duty aluminum foil.

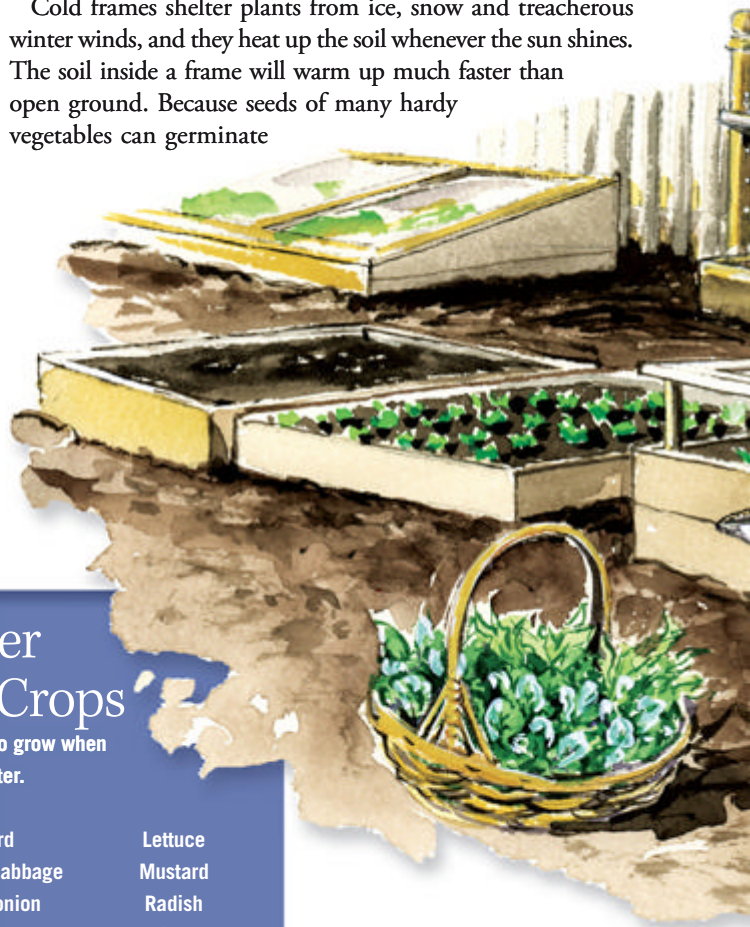
How Cold Frames Work

Cold frames shelter plants from ice, snow and treacherous winter winds, and they heat up the soil whenever the sun shines. The soil inside a frame will warm up much faster than open ground. Because seeds of many hardy vegetables can germinate

Top 12 Winter Cold Frame Crops

These 12 vegetables are easy to grow when sown in cold frames in late winter.

Arugula	Chard	Lettuce
Broccoli	Chinese cabbage	Mustard
Beets	Green onion	Radish
Cabbage	Kale	Spinach



in the 50-degree-Fahrenheit range, a three-day spell of mild weather often coaxes them to life. Weed seeds will germinate alongside the seeds you plant, but you will see fewer weeds if you cover the soil's surface with a 1-inch-deep blanket of potting soil (purchased or homemade). Add water as needed to keep the soil from drying out.

After seeds have begun to grow inside the frames, the plants are surprisingly cold-tolerant. Yet these and other winter-sown vegetables will suffer if a frame is allowed to over-heat, so it's crucial that frames be opened to vent out excess heat. When in doubt, it is always better to vent than to risk frying your plants. If you can't be around to open and close your frame and a warm sunny day is in the forecast, covering the top of a closed frame with a light-blocking blanket for a few days is your safest strategy.

Climate-Controlled Frames

Any cold frame will harness solar energy for your plants' benefit, and there are several low-tech ways to help your frames retain solar warmth. Black antifreeze containers, or milk or kitty litter jugs painted flat black, can be filled with water and tucked in the corners. Or you can cover the spaces between plants with flat stones painted black, or "solar pillows"—plastic freezer bags painted black and filled with water. If you want to get more sophisticated, check out the Solar



Milk Jug Seed Starters

This simple technique was developed for seeds that need to spend a winter outside before they will germinate, but it's also a great method to start garden seeds in late winter if you don't have indoor lights or a cold frame.

1. Cut a gallon milk jug (or other large plastic container) in half horizontally, leaving one edge intact to use as a hinge. Discard the cap.
2. Punch several drainage holes in the bottom.
3. Fill the bottom with 3 inches of potting soil, moisten well and plant your seeds.
4. Fold down the top cover and secure the cut seam with duct tape. Enclose the planted jug in a large clear or opaque plastic bag (such as a produce bag), held together at the top with a twist tie.
5. Place in a sunny, protected spot outdoors.
6. One week before transplanting, harden off seedlings by removing the bag and tape, and propping the jug open with clothespins.



soil. As the manure decomposes, it releases heat into the frame.

But you don't need fresh manure to build a hot bed—or at least a warm one. For example, let's say you want to winter-sow broccoli, spinach or another crop that needs abundant nutrients. If you dig out a bed and refill it halfway with compost mixed with the cheapest dry dog food you can find (a surefire compost activator), and then top it with 6 inches of soil, the compost will generate enough heat to keep the little plants from freezing and thawing quickly—if they freeze at all. In spring, when the plants' roots find the buried treasure deep in the bed, you may be looking at the biggest plants you've ever grown.

Another option is to use the warmth generated by rotting hay to heat your cold frame from the sides. If you have plenty of space available and you plan to mulch with hay or straw this season anyway, go ahead and get four bales and arrange them in a semicircle on ready-to-plant ground, with the open side facing south. Plant the middle, and then top the bales with a wide sheet of plastic stapled to two 2-by-4s; one board will lie atop the back bales, and the other will anchor the plastic to the ground in front. You can make

a bigger hay bale haven by arranging seven or eight bales in a square, and topping the enclosure with an old window, glass door, or piece of sheet vinyl or corrugated fiberglass. Or, make your bales go twice as far by halving them horizontally and encircling your planting with half bales, set side by side with their cut sides out. Allow the broken bales to get damp before you plant, and then cover the bed and bales with a large piece of plastic sheeting. As the wet hay decomposes, much of the heat it releases will stay inside the bed.

To prepare a hot bed, warm bed or solar-charged cold frame if the soil is frozen, simply place a closed frame over the spot for several days. Daytime heating will thaw the soil.

Various types of cold frames are multiplying like rabbits at my place, and spring now comes to my garden at least six weeks ahead of schedule as a result. 🌱

Pods and Solar Cones developed by New Hampshire gardeners Leandre and Gretchen Poisson. Described in detail in their book *Solar Gardening*, and in MOTHER's online Archive (find it online at <http://goo.gl/bmsxg>), the Poissons' devices are probably the best you can build if you can afford the materials. The superior performance of these garden appliances comes from the use of Sun-Lite® flexible fiberglass, which costs about \$89 for a 4-by-8-foot piece.

Historically, gardeners have used the warmth generated by rotting manure to turn cold frames into hot beds. To make a hot bed, dig a hole inside your frame at least 12 inches deep and fill it with fresh horse manure mixed with straw and topped with 6 inches of

Anatomy of a Cold Frame

Consider these factors when building a box to extend the growing season.

Site surface: Frames work best if the top is angled slightly toward the winter sun. You can either cut slanted sides (see illustration, Page 25) or mound soil to make the back edge of the frame sit slightly higher than the front.

Frame: Scrap wood or untreated 2-by-4 or 2-by-6 pine boards are fine. You can upgrade to rot-resistant cedar, redwood or locust, or composite plastic lumber. Other options include logs, baled hay or straw, bricks, or concrete blocks.

Corners: If you only have a handsaw, a hammer and a screwdriver, you can build a sturdy box from 2-by-4s, screws and four steel corner brackets. Brackets come in different forms—some for inside the box and some for outside. The simplest (and cheapest) ones screw into the top of a frame that's already been banged together with 3-inch box nails.

Covers: The best materials for topping cold frames are tempered glass patio doors or shower doors, which are often discarded during remodeling projects. Heavy enough to resist strong winds, shatter-resistant tempered glass doors are better than standard storm windows or paned windows, which can be a safety hazard. Check with thrift stores, Habitat for Humanity's ReStore, or home remodeling or salvage businesses. Look for doors that still have hardware attached and leave it intact. Later, after you've built a frame, the existing hardware may prove handy as part of a hinge or a ready-made handle. Tempered glass doors come in all sorts of weird sizes, so it's best to source a top first, and then tailor the frame to match its dimensions.

Use thick blankets to bring winter-sown frames through winter storms, or to block sun if you can't be around to vent the frames. Snow makes a good insulating cover, too.

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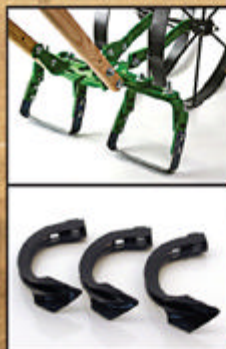
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How to Make COMPOST

Choose from many easy ways to make compost for increased garden productivity: low-cost homemade bins, piles sans bins, chicken power, pest-proof tumblers—even indoor worm bins!

By Barbara Pleasant
Illustrations by Melanie Powell

Compost is the ultimate ingredient for building fertile soil. If we all composted our kitchen and garden waste, the world would be a cleaner place, and we would all enjoy more productive organic gardens. Some folks are intimidated by this unfamiliar and seemingly mysterious process—but have no fear! Composting is nothing more than guiding the natural process by which organic wastes decompose. You simply cannot do it wrong. The only challenge is finding sufficient organic materials to make enough black gold to sustain your garden.



Many households compost using multiple methods, and you should experiment to find the composting strategies that work best for you and your garden.

Composting is *so* worth the effort. Adding compost to your garden feeds the soil food web and provides a slow release of nutrients to your crops.

Compost also vastly improves soil structure, allows the soil to hold moisture better, and improves the soil's friability (workability).

After surveying hundreds of MOTHER EARTH NEWS readers and checking out what our Facebook community had to say about home composting, we were blown away by the number of different methods and setups.

Many households compost using multiple methods, and the techniques described here are a distillation of strategies employed by MOTHER EARTH NEWS readers. Whether you're raising chickens, goats, or other veggie-eating, manure-producing animals can also have huge implications, because animals can figure so prominently in a composting loop.

Making compost with critters will get its turn, but first, let's look at some of the most commonly used compost-making systems.

Composting Techniques

Most gardeners make compost by combining their kitchen and garden waste in an outdoor compost pile and waiting for it to rot. There is no need to buy special activators or inoculants, because each dead plant and bucket of food waste added to compost activates different strains of the naturally occurring microbes that promote decomposition.

Mangled coffee filters and their kin can be unsightly, however, and aged leftovers sometimes attract unwanted animals and insects in search of food. For

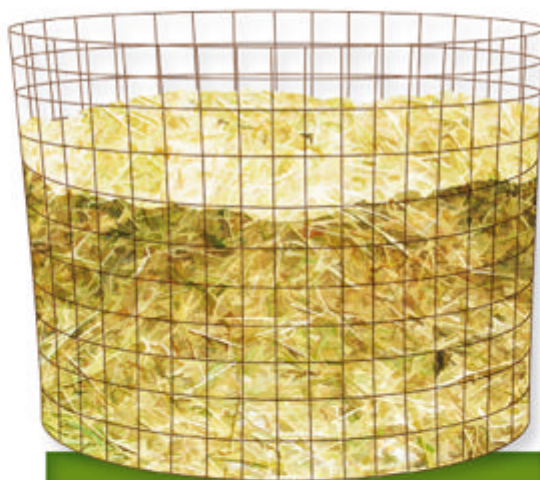


these reasons, many composters divert their kitchen waste into an enclosed compost bin or the chicken yard before they combine it with bulkier pulled weeds, spent crops, and other yard and garden waste in a slow compost pile.

“To keep from feeding critters, our kitchen waste first goes into three black compost containers until unrecognizable. Then we add it to our big fenced-in bin for yard waste. We make pounds and pounds of compost this way,” says reader Mary Conley of Omaha, Neb.

I use the same system at my house, capturing the yucky stuff in a compost bin and then mixing the transitional-stage kitchen waste into my garden compost piles two or three times a year. I like the “out of sight, out of mind” benefit of an enclosed compost bin so much that I have two—a black plastic model that sits in the garden, and a garbage can peppered with air holes that’s stationed at the corner of my deck. The latter saves me many steps through ice, snow and mud during winter (see illustration on Page 31).

On the Gulf Coast, John Burris has a special barrel for composting kitchen



Toss your leaves, yard debris and other compostables into large, easy-to-make wire-hoop compost bins.

waste, but he uses a big outdoor heap to make compost from his yard, garden and pasture waste. In California, Nell Wade puts her kitchen scraps and shredded mail into a worm bin, and she makes slow compost from her garden waste in twin bins constructed from shipping pallets (see illustration on Page 31).

Setting up a two-phase system need not be expensive. I have kept happy

composting worms in a modified plastic storage bin, and a garbage can with rusted-out holes in the bottom would quickly become a compost bin at my house. On the other hand, the expense of building or buying a compost tumbler—the ultimate in enclosed compost bins—is warranted in some situations, which include heavy pressure from fire ants, or the recurrent presence of unwanted animals such as raccoons, rats or snakes. If nuisance animals have established habitat near your property, the best way to avoid problems is to raise your compost off the ground in a secure container.

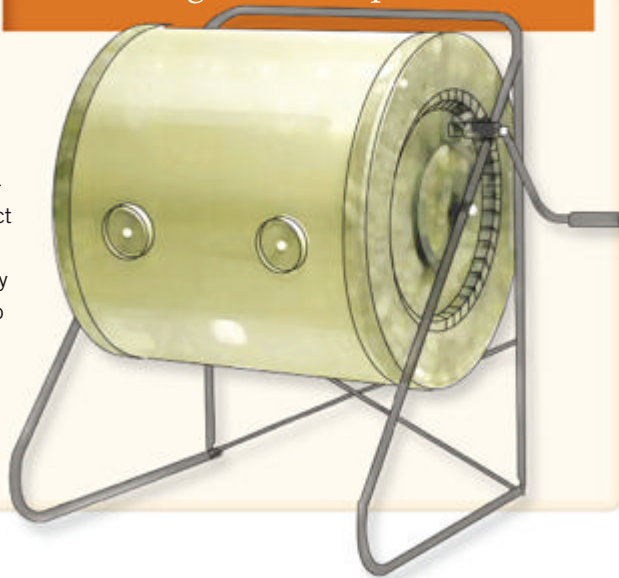
“I have an insulated drum compost bin, which results in much higher heat, so I can even compost scrap meat and fish. It has a double bin, so I’m always composting. We’re in the far suburbs, and it keeps the rodents away because it’s on a stand,” says Jan Tucker of California. Whether purchased or homemade, off-the-ground drum compost bins (also called “compost tumblers”) take a few months to pick up speed. After the walls and crevices become well-colonized with microbes, a compost tumbler is quite efficient (see illustration below).

Sizing Up Compost Bins

Using an enclosed compost bin is one of the easiest ways to make compost from kitchen waste, and you can choose a model that fits your needs and your budget. If you need something small that can be kept indoors, by all means consider a worm bin (see illustration on Page 32). Available in three colors, The Worm Factory costs about \$100 and this multi-tray bin is easier to maintain than a homemade worm bin (go to www.NaturesFootprint.com). For outdoors, I was able to buy The Earth Machine (www.EarthMachine.com) through my local compost-education program for \$35—about the cost of a good rolling garbage can. Because the main purpose of an enclosed compost bin is to capture kitchen waste, it need not be large. In five years, I have never completely filled my 80-gallon compost bin, and the garbage can I use to collect kitchen waste in winter works wonderfully despite holding only 30 gallons.

Many compost bins lack in the good looks department, but you can easily change that. A friend wrapped her garbage-can compost bin with a bamboo roll-up shade, and it looked so good she moved the can to her patio. Tired of looking at a plastic tarp, another friend used brocade draperies from a thrift store to artfully disguise her outdoor bin. On a visit to Pennsylvania, I once saw a beautiful bin made from hand-woven willow. If you don’t like the way your compost bin looks, change it!

Keep critters out of your compost and make mixing simple by using an off-the-ground compost tumbler.



At the other end of the spectrum are gardeners who keep compost super-simple: They let their soil do it. "I keep a coffee can in my freezer and fill it up with whatever is to be composted. When it's full, I take it out, dig a hole in the garden, throw the whole mess in there, and cover it back up with dirt. I call it 'direct composting,' and it works for me. I have worms as big as my fingers," says Roberta Lott of St. Louis.

I, too, participate in direct composting (sometimes called "trench composting") in fall when I have buckets of fruit waste that would otherwise attract yellow jackets. Buried in my permanent beds in September, the fruit trimmings are gone by the time the soil warms in spring.

MOTHER EARTH NEWS Editor-in-Chief Cheryl Long prefers "sheet composting." "I have a local farmer who brings me free bales of old hay, plus my office mates bring me their bagged grass clippings," she says. "I use them to mulch the paths throughout the garden. The next spring, the hay and grass have decomposed. I scoop the top layer of enriched soil from the paths into the growing beds and put down another layer of hay mulch."

As for outdoor bins, your compost won't care whether the bins are handmade wonder bins, enclosures made from used shipping pallets, or a simple circle of wire fencing (see illustration on Page 30). With enough time and moisture, whatever you put in the bin will rot. Giving a compost pile at least one wall, however, goes a long way toward conserving moisture. The

Punch holes in the bottom of an old garbage can, and you've got yourself a free compost bin!

wall(s) can be made of wood, concrete blocks or packed earth. One reason pallet bins are so popular is because they retain moisture better than open piles while keeping the composting area free of debris.

Many gardeners make use of the passive soil improvement that occurs beneath compost heaps to prepare future garden space. "I compost my yard waste in an area where I want a new raised bed. I just keep piling it on, and it just keeps composting itself," says Roberta Lott. In the Chesapeake Bay area of Virginia, Julie Patrick Clark says she finally got smart after 27 years of making compost. "I started building a compost pile beside each of my nine raised beds. No more hauling compost all over the place."

Most gardeners would like to make more compost without bringing in risky materials (see <http://goo.gl/tTr539> for MOTHER EARTH NEWS articles about pesticides that persist in compost). One



way to add bulk to your compost pile is to grow more cover crops right in your garden. In a hand-tended garden, most cover crops are pulled rather than turned under, and armloads of vetch, cereal grains or buckwheat will transform a sleeper heap into a slow smoker. Also check whether overripe produce is available from local markets or organic restaurants. Extra compostable material is a resource that may become even more valuable when animals enter the picture.

Compost with Animals

Most farmyard animals play key roles in a household's waste management stream. Chickens find joy in sloppy

You can fashion a multi-bin composting setup out of repurposed materials, such as wooden shipping pallets.



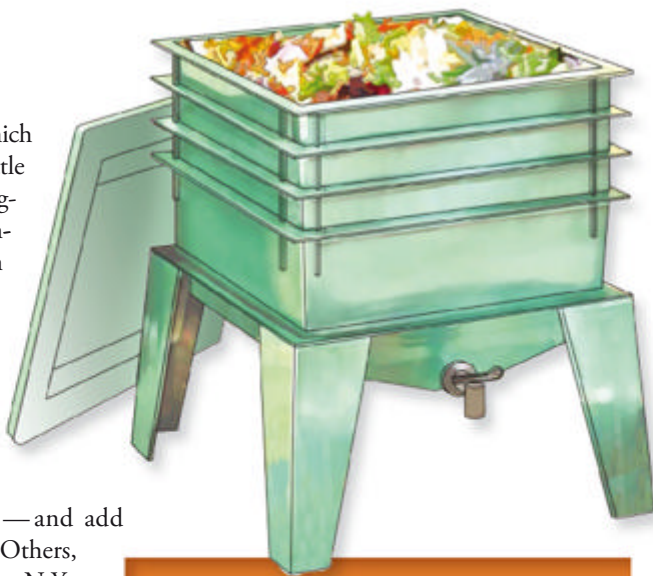
buckets of kitchen waste, which they peck and shred until little is left. Many growers have figured out how to make compost by letting the chicken run double as the composting area, like the folks at Salt of the Earth Urban Farm in Portland, Ore.: "Our main compost bin is in the chicken run, where the hens snack, scratch and turn the pile—and add their manure to the mix." Others, like Helen Cano of Ferndale, N.Y., give their girls kitchen waste right in the coop. "What they don't eat, they mix with the straw on the floor of the coop. By the time this comes out of the coop, it is well-mixed, almost-complete compost. From there it either goes on the garden or into the compost pile for future use," she says.

Another idea that requires less clean-up is to maintain the compost area as a fenced-in daytime activity area for your chickens. "I just pile stuff on, add some water, and let the chickens into the compost yard every couple of weeks to turn the piles. In no time I have beautiful black gold," says Kevin Kidd of Valley Springs, Calif.

Mike Warren has found that having his chickens visit his well-managed compost pile works out better than feeding them kitchen scraps in their run, which

attracted unwanted varmints. "They still get in there, turning it over while looking for slugs and bugs," he says.

My research on making compost with companion chickens led me to fear-filled message board threads on chickens picking up parasites from eating earthworms and other moving things, so I called my brother, Andrew Duke, DVM, of Mobile, Ala. "In 34 years of veterinary practice, I have never been called to a parasite situation in a home flock," he says. "It's probably because



Hardworking worms in a compact bin create compost quickly, and the setup is perfect if you have little space.

home flocks are so much cleaner than commercially raised chickens."

Chickens are great for making compost, and so are other manure-producing animals such as rabbits, goats and even horses. In Virginia, organic farmer Dennis Dove keeps a pastured horse that makes good compost even better. Throwing layers of horse manure on the farm's veggie-based compost makes the manure go much further than it would if used as a single-ingredient soil amendment.

In the same region, reader Liz Wallace has worked out a plan that makes the most of the manure from her chickens and goats. "I have multiple piles and one big container. The container gets fallen leaves and the table scraps the chickens don't eat, one pile gets the goat and chicken poop and bedding, and the other gets everything else (yard waste other than leaves, small woody stuff, etc.). The goat and chicken poop breaks down and can be used pretty fast, so I don't want to mix it with things that take longer," she says. "The table scraps are wet enough that they need dry stuff mixed in with them to decompose aerobically, and I leave the third pile to decompose slowly, in about a year."

At your house, an ideal system might include an enclosed compost bin, semi-permanent bins that can be moved to wherever you're planning new beds, temporary pens for leaves or other seasonal materials, or perhaps all of the above plus a worm bin, too. Each refinement you make in your composting system should better accommodate your home's waste disposal needs and give a good return for your soil. Eventually, you will learn how to make compost in ways tailored to you, your home and your garden. 🌱

Quick Tips for Making Compost

- Any plant material that's now dead (or needs to be) can be composted. Adding meat and oily food products is not recommended, as they take longer to decompose.
- Leaves, old plants, fruit and veggie trimmings, weathered mulches, and pulled weeds provide volume in a compost pile, which needs to be big—at least 3 square feet—to maintain moisture well.
- Veggie scraps are naturally moist, so compost piles that contain a lot of kitchen waste need to be layered or mixed with bulkier material to keep them from becoming slimy.
- Turning a compost pile mixes and breaks up materials, which speeds decomposition. When it comes to turning, you can do as much or as little as you like, depending on your desired turnaround time.
- Covering new kitchen waste with 4 inches of plant material works well with little or no turning.
- Keep compost piles moist but not soggy.
- Add a few shovelfuls of soil to your pile from time to time.

Barbara Pleasant is a leading organic gardening expert and the author of *The Complete Compost Gardening Guide*, which is available online at <http://goo.gl/FT2Ct>.

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Care and Cultivation of PERMANENT GARDEN BEDS

Choose permanent garden beds and pathways to provide a secure habitat for the dynamic soil food web that sustains your crops.

By Barbara Pleasant
Illustrations by Elayne Sears

One of the basic tenets of organic gardening is to put as much effort into improving soil fertility as you put into growing your crops. If you use permanent garden beds and pathways, you can concentrate on building soil in deeply worked beds that will improve over a period of years, all the while growing robust, disease-resistant vegetables. Permanent beds also make more efficient use of water and fertilizer, and soil compaction is limited to the pathways, where repeated footsteps can naturally inhibit the growth of weeds.

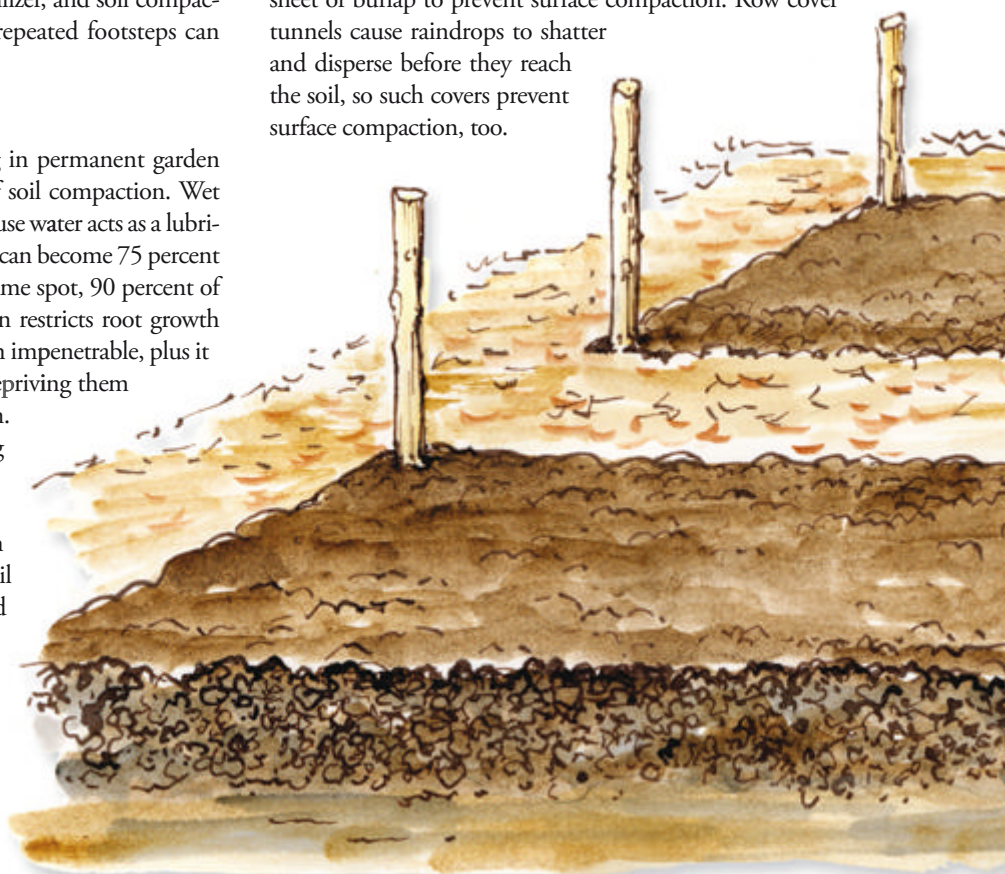
Limiting Soil Compaction

One of the big advantages of working in permanent garden beds is that you can limit some forms of soil compaction. Wet soil is especially prone to compaction because water acts as a lubricant. The first time you step on wet soil, it can become 75 percent compacted. After the fourth step in the same spot, 90 percent of the pore spaces are gone. Soil compaction restricts root growth physically because overly dense soil is often impenetrable, plus it handicaps any roots already present by depriving them of oxygen and access to soilborne nitrogen.

You should always try to avoid stepping on your garden beds, but some operations—such as building trellises or using a broadfork—require standing space. In these cases, you can prevent unnecessary soil compaction by standing on a wide board to distribute your weight. Standing on a board or using boards as walking bridges over garden beds will reduce your body's ground pressure from about 8 pounds per square inch to less than 1 pound. Just as snowshoes make it possible to walk on snow by distributing your weight,

boards, wide steppingstones or flakes of baled hay can help protect vegetable beds from the compaction caused by footsteps.

Surface compaction caused by driving rain can also be troublesome, especially for clay soils. When bare soil is subjected to heavy rain, the larger particles and organic matter often wash away in the run-off, leaving behind a surface layer of fine particles that dries into a crust. Organic mulches will cushion the soil from the pressure of heavy rain and protect it from erosion. In situations where you can't mulch—in a newly seeded bed, for example—use a sheet of burlap to prevent surface compaction. Row cover tunnels cause raindrops to shatter and disperse before they reach the soil, so such covers prevent surface compaction, too.



Garden Bed Options

Garden experts talk mostly about *raised* beds, but these are not essential and can be expensive to build. Our point here is that rather than plowing or tilling your entire plot each year, it's better to lay out and tend permanent areas for beds and paths. The beds can be raised if you are in a rainy climate, or sunken if your site is dry and windy. Flat beds are also fine, with markers to distinguish the beds from the paths.

If you do choose raised beds, framing is optional. The plants will grow just as well in unframed beds, although you'll probably need to do a bit of rebuilding each spring. Framing does make the beds look sharp, but lumber for framing can be expensive. Low-cost or free options such as logs or recycled cedar fence rails work fine—just lay them along the long sides of your beds as shown on Page 36. There's no need to enclose the ends; if you leave them open, it will be easier to adjust the beds' positions if you need to in the future.

Many gardeners like framed garden beds because they can use the frames to support or anchor row covers, plastic, bird netting or other protective covers. For example, pipe brackets installed on the outside of wood-framed raised garden beds can be used to hold the ends of hoops made of wire or plastic pipe, or the ends of wire hoops can be pushed into the ground just inside the frames to provide a firm anchor. The trend toward more extensive use of protective covers is so prominent that many gardeners regard bed-framing materials primarily as structural

foundations for tunnels or plastic-covered boxes that do the work of small greenhouses.

Building Soil Fertility

Every soil type has an innate texture based on the size of indigenous soil particles. Clay particles are small, so clay soil feels slippery when wet. Sandy soils have much larger particles, so they feel gritty. The tiny size of clay particles means the spaces between them are small, too. In comparison, the spaces between sand particles are huge. To increase the sponginess of either type of soil and prepare it for the task of growing vegetables, a thorough digging is in order to incorporate spaces for air and organic matter, such as grass clippings or compost.

After starting new gardens in several different states, I have yet to encounter soil that was not vastly improved by deep digging in

Use a broadfork to relieve soil compaction while still conserving the soil food web.



the garden's first two years, with constant inputs of compost and mulch to raise its organic matter content. With time, the soil's most important component evolves—a dynamic community of bacteria, fungi and insects. These soil critters exude natural glues and enzymes that bind soil and organic matter particles, creating loamy structure. After five years of thoughtful organic management, any soil should show notably improved structure, with a profile of 50 percent indigenous soil particles, 25 percent pore spaces for air, water and roots, and 25 percent biosphere of bacteria, fungi, earthworms and other life-forms.

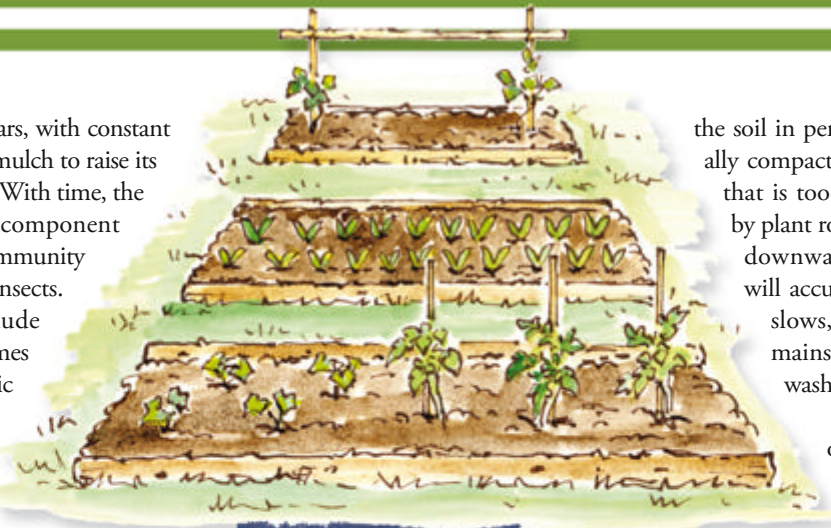
This biosphere is crucial because it's what improves your soil structure, and it's the means through which most plants get essential nutrients. Of particular interest is a talented group of soil-dwelling fungi that form dynamic relationships with plant roots. Collectively known as mycorrhizal fungi, they form colonies around roots that enhance a plant's ability to take up nutrients and water, and increase its resistance to soilborne diseases. To learn more, see "Mycorrhizal Fungi: The Amazing Underground Secret to a Better Garden" at <http://goo.gl/9hUFSy>.

Conservation Cultivation

Cultivation has the unfortunate side effect of ravaging beneficial fungal colonies, so *when* you cultivate your garden beds is important. For example, turning up and shattering spadefuls of soil in fall destroys colonies of many beneficial fungi, and they won't have time to recover before cold winter weather ends their season of active growth. As a result, spring crops get planted into soil that's in microbial disarray. The story changes if you stop short of cultivating when cleaning up beds in fall, and instead either plant a cold-hardy cover crop, such as hairy vetch or cereal rye, or cover the soil's surface with a winter mulch. These are the preferred methods for conserving healthy populations of beneficial fungi, including strains that help legumes capture and accumulate nitrogen, the main nutrient plants need for vigorous new growth.

After coaxing along permanent garden beds with infusions of organic matter for a few years, most gardeners will switch from deep digging to cultivation methods that are less traumatic to the soil's structure. Shallow cultivation at the surface is often needed to prepare seed beds, mix in organic fertilizers and control weeds. In a small garden, this can be done easily with a sharp hoe, and in a big garden, with a tiller set to go no more than 4 inches deep.

A more vexing problem often lurks below ground, as natural forces will cause



You can make simple, low-cost framing using logs or recycled cedar fence rails. Leaving the ends open makes it easier to use a tiller to prepare seed beds.

the soil in permanent beds to gradually compact and form a "hardpan" that is too tight to be penetrated by plant roots. As water percolates downward, fine soil particles will accumulate where drainage slows, much as fine soil remains in your sink after you wash vegetables.

Research done by cooperating farmers at Cornell University's Reduced Tillage Vegetables Project

has found that cutting a narrow slit—1 to 2 inches below the hardpan layer—is the least destructive way to restore the drainage capacity of compacted subsoil, which in turn boosts plant productivity. In a small raised bed, you can do this using a

digging fork. In larger gardens, a broadfork is the best tool for preventing or relieving compacted subsoil.

MOTHER EARTH NEWS first published plans for building your own broadfork in 1980 (go to <http://goo.gl/dD2rZ>). The broadfork has since been embraced by many organic gardeners as the best way to reintroduce air to the deepest sections of a permanent bed without tearing up the soil's structure and thus setting back the soil-building process. Along with air, soil amendments such as compost, wood ashes or organic fertilizers will naturally sift into deep holes made by a broadfork.

I use a broadfork often, but in my clay soil, it isn't entirely able to take the place of deep digging to mix in organic matter and a fresh supply of air. I try to limit my forking or digging frenzies to warm weather. Soil recovers faster from digging under warm conditions, and nutrients released as the roots and shredded fungal mycelium decompose can be used by the next crop.

When you keep garden walkways in vegetation or mulch while minimizing cultivation in adjoining beds, you're practicing what is called "zone tillage." Walkways become refuge areas for night crawlers and other soil-building creatures, while the beds get cultivated only as much as needed to accommodate changing crops. Even compacted pathways can host numerous earthworms as long as there is vegetation or mulch at the surface. In a 10-year study done in West Lafayette, Ind., earthworm counts under pathways planted with a bluegrass-clover mixture averaged 400 per cubic meter, compared with 340 in a dairy pasture and only 20 in a no-till field planted in continuous corn.

Recently I heard a soil-minded gardener joke that growing cauliflower takes about five years—four for soil-building and one to grow the crop. He was right, because cauliflower and many other vegetables won't prosper in low-integrity soil. Growing in wisely nurtured permanent garden beds guarantees better results, season after season. 🌱

Barbara Pleasant's book *The Complete Compost Gardening Guide* is available at <http://goo.gl/jC3n3>.

SEED STARTING

Made Simple

Starting seeds indoors is a sure cure for the restlessness that plagues gardeners during the off-season — and it's practical, too!

By Vicki Mattern

You'll love the benefits of growing your own transplants. You can grow unique heirloom selections as well as the best varieties for your garden's conditions—which will boost your yields and reduce losses to pests, disease and severe weather. The potential money savings aren't small potatoes, either. Consider the cost of filling a

single 4-by-12-foot bed with purchased transplants—typically selling for \$4 to \$5 each—versus paying \$2 to \$3 for a packet of at least 50 seeds. If you grow a big garden, the savings can quickly grow to hundreds of dollars. Indoor seed starting is easy, and the small initial investment in equipment will pay off quickly. Follow these 11 steps to get started.

1. Sow what? Starting seeds indoors gives you a jump on the growing season,

allowing you to harvest heat-loving crops, such as tomatoes, peppers and melons, earlier and over a longer period of time. (If you have a short growing season, it's the only way to get mature produce from these crops.) Some cool-weather crops, such as broccoli, also benefit from an indoor start so they have time to mature outdoors in spring or fall, before midsummer heat or winter freezes set in.

Not every crop is a good candidate for indoor seed starting. Beans, peas and root crops should be sown directly in the garden because they don't transplant well.

2. Seed matters. Start with high-quality seeds and varieties suited to your region's conditions. Buy from reputable suppliers who do their own germination tests and,



preferably, their own variety trials, advises Steve Solomon, founder of Territorial Seed Co. in Cottage Grove, Ore., and author of *Gardening When It Counts*. Quality seeds sprout faster and at a higher rate, grow into stronger seedlings, and produce more, he says.

Try getting seeds that are well-adapted to your region from local seed swaps, or buy from regional suppliers. Companies that do their own germination tests and field trials usually say so in their catalogs. Most seed companies offer a free catalog, or you can order seeds from their websites.

To browse a directory of more than 160 mail-order seed companies, go to www.MotherEarthNews.com/Seed-Directory. To search for varieties among a stock of more than 500 seed companies, use our Seed and Plant Finder at www.MotherEarthNews.com/Custom-Seed-Search.

3. Timing matters. Most beginning seed-starters jump the gun, says Rob Johnston Jr., founder and chairman of Johnny's Selected Seeds in Maine. Transplants held indoors too long can become root-bound and weak—a setback that makes plants more susceptible to problems outdoors. However, starting seeds too late can mean you miss the optimum growing window. To find out when to start seeds of specific crops in your area, check out our What to Plant Now page at www.MotherEarthNews.com/What-To-Plant-Now.

4. Cells, flats or blocks? You need 2- to 3-inch-deep containers with drainage holes to hold your seed-starting mix. If you have plastic six- or eight-packs from nursery transplants, use them. Many people use recycled yogurt cups, or you can buy a simple seed-starting tray with cell pack inserts. Some come with a plastic dome that will help preserve moisture (more about that in a minute), but covering trays with a sheet of plastic wrap will also work. Some gardeners sow their seeds in furrows in a single flat, but sowing in individual cells saves time and reduces the risk of disturbing roots at transplant time. Smaller cell inserts called “plugs” are useful for bigger transplants—such as tomatoes—that you plan to pot up indoors. Soil blocks, made by squeezing prepared starting medium out of a tool called a



Order seeds in winter to be ahead of the game for spring seed starting (above). Create seed-starting pots on the cheap by forming cylinders out of newspapers (left). Transplant your seedlings into larger containers as they mature (below).

“soil blocker,” are another option. Soil blocks use no containers at all—each block serves as its own seedling container.

5. The planting mix. It's important to use a loose, well-drained mix for indoor seed starting. Commercial peat-based mixes are widely available in garden centers and hardware stores, but peat moss is virtually nonrenewable because of its extremely slow growth rate and because harvesting it destroys the wildlife habitat provided by the peat bogs. You may be able to find seed-starting mixes that contain coir instead of peat.

“Coir, a byproduct of the coconut industry, is a better alternative,” says Solomon, whose homemade seed-starting mix consists of one-third coir, one-third compost and one-third good garden soil. “Coir provides the same porous texture as peat moss and is easier to keep wet,” he says. To supply nutrients for the seedlings,



the mix should include quality, screened compost and an organic fertilizer blend, suggests Eliot Coleman in his book *Four-Season Harvest*. The compost will provide trace nutrients and help prevent disease.

6. Feed and water wisely. Several hours before you fill your containers with seed-starting mix, put the mix in a bucket and stir in enough water to moisten it uniformly. (This is much easier than watering the mix after you sow, and it pre-



You could buy a handy seed-starting station (left) or save big bucks and create something similar on your own to give your seedlings a healthy start.

Seed-Starting Problems and Solutions

Seedlings suddenly keel

over and die: Prevent “damping off” by using a porous seed-starting mix, and don’t over-water.

Seedlings look tall, pale and spindly: Increase light. Use fluorescent lights (not a window),

and keep them no more than 1 inch above the tops of seedlings. Keep the lights on for 14 to 18 hours daily.

Tiny dark “flies” show up: These pests likely are fungus gnats, which can damage seedling roots.

The gnats commonly feed on decaying organic matter, so be sure any compost you’re using is mature. Don’t over-water, and use yellow sticky traps or Knock-Out Gnats, a biological pesticide, to control these pests.

vents you from dislodging newly sown seeds.) Fill your containers with the pre-moistened mix, then plant two or three seeds per cell at the depth recommended on the seed packet. Cover the containers with plastic wrap or a plastic dome if you have one—the plastic will hold just enough moisture to encourage germination. Remove the plastic as soon as sprouts emerge. Water seedlings gently when the soil feels dry to the touch, either with a mister or by filling the tray below the cells with water. If your starting mix didn’t contain an organic fertilizer blend, feed seedlings a diluted, liquid organic fertilizer (such as fish emulsion) when they form their first true leaves.

7. Prevent damping off. Too much moisture and humidity can encourage damping off, a fungal disease. Prevent this problem by adding a half-inch layer

of light-colored sphagnum moss to the top of your seed-starting mix. Research from the University of California, Davis, shows that sphagnum moss absorbs 20 times its weight in water while offering excellent aeration for seedlings. The moss also contains bacteria known to inhibit certain plant diseases and fungi that attack young seedlings. The researchers estimated that using sphagnum moss could prevent 80 to 90 percent of damping off problems.

8. Warm up to heat mats. Ideal germination temperature for most vegetable seeds is between 70 and 90 degrees Fahrenheit—a range most homes can’t provide steadily in winter. Encourage fast sprouting by providing warmth from below your seedling flats, which is easiest to do with an electric germination mat (about \$40). You could also set the con-

tainer on or near another source of heat, such as a shelf placed above a radiator (not on the radiator itself!), near a furnace or in the same room as a woodstove.

9. Light right. Seedlings need brighter light than the average home can provide in late winter. You could buy grow lights for your seedlings, but standard fluorescent lights will do just fine. Keep the lights suspended an inch or less above the tops of seedlings, raising the lights (or lowering the containers) to maintain that distance as seedlings grow. Seedlings do best with 14 to 18 hours of light per day. Using an inexpensive timer (about \$20 or less) makes achieving that range easy.

10. Strong and steady. Help your seedlings grow steadily, without interruption from insufficient water, nutrients or root space. After they’re well-established, pinch out the weakest seedlings in each cell, giving the strongest survivor room to grow. Lightly brush your hand over the tops of seedlings daily to promote sturdy stems (this simulates the effect of wind). If your starts appear to be outgrowing their containers, move them into bigger ones as soon as possible.

11. Transitional tactics. After four to six weeks, your seedlings will have grown into sturdy plants ready for the outside world. Help them make the transition by allowing them to adjust to outdoor conditions slowly, a process called “hardening off.” To do this, keep your transplants in a sheltered location, such as on a porch, for about a week, bringing them in at night and gradually moving them into brighter sunlight each day. (If you move seedlings from indoors into a full day of sun, they’ll sunburn.) After your plants have been hardened off, they’re ready to grow in the garden, where they’ll reward you with a bounty of tasty, nutritious food. 🌱

To find out when to start seeds and when to plant out transplants based on your ZIP code, try our Vegetable Garden Planner (www.MotherEarthNews.com/Garden-Planner) or the Grow Planner app for iPad and iPhone (www.MotherEarthNews.com/Grow-Planner).

CHICKENS in the GARDEN

You can “recoop” much of the expense of raising chickens by putting their manure to work in your garden and enlisting your birds for organic pest control.

By Patricia Foreman and Cheryl Long
Illustrations by Elayne Sears

Fresh, nutritious eggs and homegrown roast chicken dinners are reason enough to raise your own poultry. If you use your chickens in the garden, you can also harvest rich manure to create homemade fertilizer, and put your flock to work mixing organic wastes into superb compost. Plus, if you let your birds range on your property, get ready for a big bonus: They'll provide terrific control of ticks and other pests.

The Cost of Raising Chickens

An adult standard hen eats about 84 pounds of feed per year, according to Ohio State University (she'll need less commercial feed if she is free-range, penned on pasture or given lots of table scraps). Bagged feed at a retailer, such as Tractor Supply Co., currently costs about 35 cents per pound, so feeding one hen for a year will cost close to \$30. This number will be higher if you pay a premium for organic feed, and lower if you buy your feed from a bulk supplier. How many eggs each bird lays will vary depending on her breed, age and your management choices, but you should get 200 to 250 eggs per year. So, you'll spend between \$1.40 and \$1.90 on feed per each dozen eggs. Not factoring in the other benefits we'll discuss later on, comparable eggs from a supermarket would have cost you \$2.50 to \$5 per dozen. (The cost of raising a chick to adulthood would require some initial investment, but this expense is offset by the value of using the hen in soup after her egg-laying days have passed.) For a thorough discussion of the costs of raising meat birds, see “Raising Broiler Chickens” by Gail Damerow at <http://goo.gl/i4q8mh>.

Bird Benefits: The Garden Factor

Now, what about the benefits of raising chickens beyond eggs and meat? Some people keep chickens or guineas in the garden solely for tick control. MOTHER EARTH NEWS readers remark year after year that free-range chickens are highly effective as a means of organic pest control. See Page 44 for their reports.

Putting a value on lowering your risk of contracting Lyme disease is pretty difficult—we can, however, estimate the value



You can incorporate your birds into your garden using wire tunnels, portable pens and uniformly sized permanent beds.

of the chicken manure fertilizer you can harvest from each bird. Chickens can use only a fraction of the energy from the grains they are fed; they excrete the rest in their manure. A backyard flock's poop, if applied correctly and especially if combined with high-carbon matter—such as wood shavings, straw or leaves—adds nutrients to the soil and increases the soil's organic matter content.

Each bird produces about 8 to 11 pounds of manure per month, as reported by Ohio State University and the University of Hawaii Cooperative Extension Service. Fresh chicken manure contains about 1.5 percent nitrogen along with good amounts of numerous other essential nutrients. Because nitrogen is the nutrient that's most often in short supply, we'll use it to estimate the value of chicken manure fertilizer.

The 8 to 11 pounds of fresh manure produced by one chicken in a month contain 0.12 to 0.17 pounds of

nitrogen. Each season, most garden crops require a target range of 0.25 to 0.33 pounds of nitrogen per 100 square feet, according to *Knott's Handbook for Vegetable Growers* and Woods End Laboratories. One hen, then, ranging in a 100-square-foot plot would deposit enough nitrogen to support healthy growth of most crops in just eight to 10 weeks (assuming all of her manure, including from under her roosting area, is harvested). If you were keeping the hen in a portable pen on a 3-by-10-foot (30-square-foot) bed, then one bird would deposit the target





Use Portable Pens and Tunnels to Manage Chicken Manure

To run chickens in your garden, install long, permanent chicken tunnels along one or more sides of the garden, connected to a coop where the birds sleep. Lay out dedicated garden beds using a standard width so that portable wire pens can be moved from bed to bed. Your chickens will be able to enter from the permanent tunnel into pen-covered garden beds via small gates you can open and close as needed. The tunnel system allows you to give your chickens a large, protected area in which to range and distribute manure while staying safe from predators.

1 To exclude deer and other critters, and to provide additional security for your chickens, install perimeter fencing using 16-foot-long livestock panels with 2-by-4-inch openings. These panels are durable, secure and easy to install—just pound in steel fence posts and tie the panels to the posts. To exclude rabbits and groundhogs, add a 2-foot strip of 1-inch chicken wire, bent so that 1 foot extends out from the bottom of the stock panels.

2 Create a quick, low-cost gate by folding a long section of 2-by-4-inch welded-wire fencing in half to make it stiffer, and then clip one side of it to the stock panel.

3 Install tunnels along the inside of the perimeter fencing, made from 4- or 5-foot-wide 2-by-4-inch welded wire fencing (see detailed illustrations, Pages 44 and 45), and bent to form a 3-foot-wide by 1- to 2-foot-tall tunnel when attached to the stock panels. The tunnels can be placed in overlapping 10-foot sections, which you can fold up and clip to the stock panels in order to rake out manure and litter.

A chicken-tunnel system makes easy work of harvesting manure from your backyard flock.

4 Make dedicated garden beds that are all 3 feet wide so that portable pens (made using 5- to 7-foot-wide 2-by-4-inch mesh fencing, bent to 3 feet wide with 1- to 2-foot-tall sides) can be placed on beds to allow chickens to move from the perimeter tunnels to forage in garden beds as needed. If your garden beds are 6 feet long, a portable, 8-foot-long pen can

be placed on a bed, spanning a 2-foot path and attaching to the perimeter tunnel. Install a simple flap of wire fencing as a gate between the perimeter tunnel and the portable pen covering the bed (see close-up illustration on Page 44).

5 Your coop can be a custom building including an optional toolshed, or, if you're keeping only a few birds, a couple of plastic doghouses or large storage tubs will do. (Chickens are cold-hardy as long as they are able to stay dry and out of the wind.)

6 The permanent tunnels and selected beds can be sown with cover crops and managed to provide year-round pasture for your birds. You can toss fall leaves or wood chips into any of the tunnels, and the chickens will mix them with their manure and make rich compost. Your portable pens can do double duty to support clear plastic or row covers for built-in season extension.

7 Roosters can be kept in the end section of a permanent tunnel—with a large plastic tub for shelter—and allowed to mingle with hens as desired. (Areas for housing roosters should be at least 2 feet tall.)

—Cheryl Long

amount of nitrogen in roughly three weeks. You'll likely keep more than one bird at a time on your garden beds, which will require you to monitor the amount of time you leave them in one spot. You'll only need to keep two birds on a 100-square-foot area for four to five weeks, or three hens in the same space for only two to three weeks.

Nitrogen is a challenging nutrient to manage in your garden—you can have too much of a good thing. If you apply excessive amounts of nitrogen, some crops—such as tomatoes—will not fruit well and will grow mostly leaves. Follow the guidelines previously discussed to ensure that you keep your chickens in the garden long enough to add a good dose of plant-boosting nitrogen, but not so long as to cause unintentional damage.

Some fraction of the nitrogen in chicken manure is lost when it volatilizes into the air. You can prevent this by mixing the manure into the soil as soon as possible—watering it in if there hasn't been much rain—or composting it. Some of the nitrogen present will be in a slow-release form, which soil microbes break down gradually, making it available later in the season or even the following year.

The Value of Chicken Manure Fertilizer

Your total potential savings from using your flock's manure as home-made fertilizer depends largely on what you currently use to fertilize your garden. If you're applying grass clippings, for example, then your fertilizer is already free, and using chicken manure may not save you money (although a diversity of fertilizer sources is always a good idea). If you are buying bagged organic fertilizers, then you're probably paying anywhere from \$10 to \$35 for each pound of nitrogen. (Read more about the wide range of fertilizer prices on Page 15.) Applying those prices to chicken manure, each bird would then give you from about \$20 to \$70 of nitrogen fertilizer value every year. Ultimately, the value of your flock will vary based on the number of birds you keep, your management strategy, your garden size and your current fertilizer expenses.

Summary of the benefits. Spend \$30 per year to feed each hen, and you can get about 200 to 250 eggs; plus \$20 to \$70 worth of crop-boosting chicken manure; plus richer, faster compost (keep reading); plus organic pest control; plus great entertainment and the satisfaction of a more sustainable system.

Estimated Net Value of Keeping Chickens

Cost	
Feed	\$30
Benefits	
200 to 250 high-quality eggs	\$40 to \$100
Manure fertilizer	\$20 to \$70
Organic pest control, including lowered risk of Lyme disease	Priceless

The numbers are annual, per adult bird. The figures do not include the initial cost of purchasing equipment or chicks.



Pathogen Precautions

Though the risk of contamination is small, fresh manures can contain pathogens that could contaminate your crops and cause food poisoning. To minimize this risk, you should either apply the manure in fall and let it overwinter in your garden beds, wait at least three months after adding it to your beds before you plant any root crops or leafy greens in the plot, or compost the manure before using it. Pathogens present in fresh chicken manure die off as the manure dries, or is exposed to sunlight, oxygen, freezing temperatures, or pH extremes.

Manure Management Methods

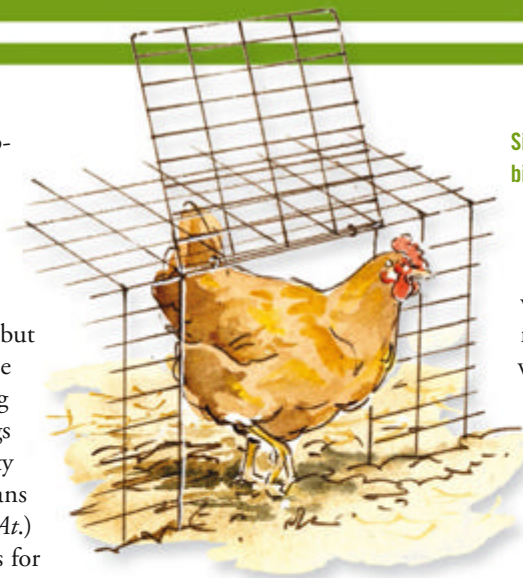
If you decide to tap the fertilizer value of chicken manure, you have several options for how to manage and house your birds. Weigh the pros and cons of each setup and decide the best choice for your situation based on the predator pressures in your area, how much time you have to care for your birds and the size of your garden. Here are several different strategies to consider.

Deep litter. Nearly half of a chicken's manure is deposited during the night and early morning, so setting up deep litter bedding where your flock roosts can capture the bulk of your future fertilizer. This method takes advantage of a stationary coop with a protected chicken run setup. Plus, the deep litter strategy makes collecting the manure for your garden beds easier.

Layer 3 to 4 inches of bedding, such as fall leaves, grass clippings, straw or wood shavings in the chicken house, especially directly beneath the perches. Every few months you'll need to move the manure and litter to your beds, as your birds won't be depositing the manure directly in your garden for you. Read more about this method in "Save Work and Time With the Deep Litter Method" at <http://goo.gl/6Ty6C4>

Portable poultry pens. You can make portable wire pens (sometimes called tractors) that fit over your garden beds, and then move your birds into the beds to apply manure in fall or when cover crops are growing. Use welded-wire fencing to make the lightweight pens. (Chicken wire,

also called poultry netting, is cheaper, but some predators can chew through it.) Sections of the wire can be clipped together with the J-clips used for rabbit pens. If the pens will be inside a fenced garden, you can make them without frames, but if the garden isn't fenced or you'll use the pens on pasture, you need a strong frame to protect your birds from dogs and coyotes. (Build MOTHER's Mighty Chicken-Mobile. Get these free plans for a portable coop at <http://goo.gl/ewaAt>.) You can use large plastic storage tubs for housing your feathered companions, and make a wire floor that flips up when you want the birds to work the soil and flips down for added predator protection.



Simple gates will allow you to control your birds' access to your garden beds.

Pens plus tunnels and gates. Use tunnels and gates made from welded-wire fencing to direct chickens from a main coop into garden beds covered with portable pens. See "Use Portable Pens and Tunnels to Manage Chicken Manure" on Page 42 for an example.

Free range. While this method doesn't capture chicken manure, it's a good option if you want your birds to eat ticks and other pests. Your flock will provide pest control in addition to having access to a better diet that supplements the feed you provide, saving you

Organic Pest Control: Reader Reports of Poultry on Patrol

Every week, we invite our Facebook fans to share their wisdom on a given topic. Invariably they post some great firsthand information. Here's a sample confirming yet again what our readers have reported in the past—chickens, ducks, turkeys and guineas all provide amazing organic pest control. (For more firsthand reader reports, see www.MotherEarthNews.com/Eggs/PestPatrol.)

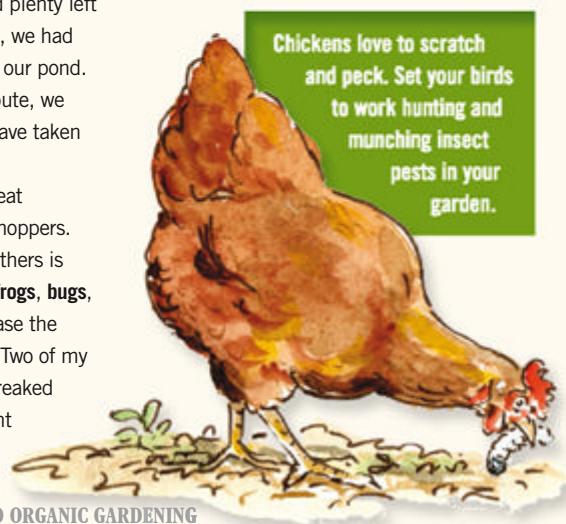
- We moved to our new home four years ago and got 12 hens. The waves of **grasshoppers** jumping in the yard have never come back, and we have never seen a **tick** anywhere, despite living in the bush and having a couple of bad years of ticks in our area. The birds free range, but the garden is fenced off. —*Rebekah Massey*
- They definitely make a difference. Compared with our neighbors, we have far fewer insects. As an added bonus, we have all the eggs we can eat and plenty left over to give away. As a side note, we had problems with weeds overtaking our pond. Instead of going the chemical route, we just got some ducks, and they have taken care of it. —*Alan Savoy*
- About the only thing they don't eat around here is the Lubber grasshoppers. Everything else that crawls or slithers is pretty much fair game: **snakes, frogs, bugs, worms** and **moths**. They even chase the **black flies** when they are bored. Two of my hens love to **de-flea the cats**. It freaked me out at first, because I thought they were attacking the cats,

but then I realized they were pecking the same spots the cats were scratching near, and the cats liked it! The kittens will actually go find a hen when they are itchy! —*Jessica Marnik*

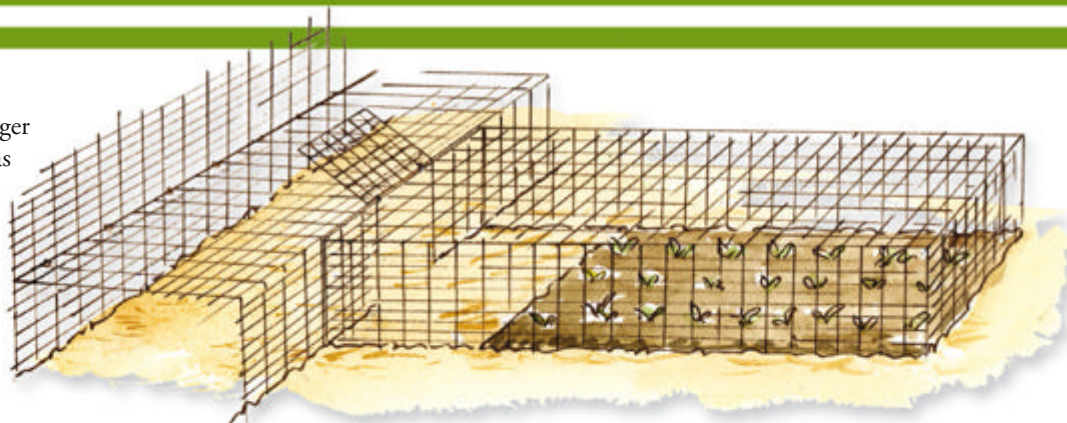
- Free-range chickens definitely helped us with our **tick** control. We were pulling ticks off my son and husband every day before, but now only a couple ticks make it on them, and that's usually after the boys have visited the woods. —*Tina Smalley*
- Our chickens are doing wonders at organic pest control. I haven't seen a **tick** since we turned them out. But, oh my, do they love my flower beds. —*Greedith Butler*
- Since I've gotten chickens, my neighbors and I have noticed a great decrease in the number of insect pests. That said, chickens are vigorous diggers and scratchers. They'll tear up any garden or planting area

that has soft dirt or mulch. Our chickens first destroyed our yard, then they wandered over and did the same to our neighbors. Now we only let them out when we are gardening or mowing and can keep an eye on them. —*Suzanne Menear Lane*

- I have more than 30 chickens that have cut way back on the yard bugs, especially **stink bugs**. They also till up the garden and help with composting. —*Lisa DeSantis*
- Our neighbor's free-range chickens patrol our yard, and those ladies seem to do a great job keeping the pests down. I think the mosquito population still has a leg up on them, though. —*Scout O'Brien Scott*
- I have definitely seen a drop in **mosquitoes** and **grubs** thanks to using my free-range poultry as my natural pest control method. —*Alexandra-Michael Hoxworth*
- In New York, before we got backyard chickens, we had to check the dogs for **ticks** often. After we got them, no more ticks! —*Elizabeth Rutherford Sinnott*
- **Black widow spiders** are common everywhere in the yard where the hens can't reach, but they're totally missing where my hardworking girls can get them. —*Sarah Sparklers*
- Our chickens have most definitely lowered the **tick** population here. Not so sure about the mosquitoes—we live right on a lake. —*Bear Lake Farm*
- Our flock of chickens is doing the best job—no more **grasshoppers** munching on the vegetables. All I need to



money. You'll likely suffer a larger toll due to predator attacks, as even mobile electric fencing can't protect your birds from hawks. A good farm dog can lessen predatory pressures, or you can let your birds out only while you're outside or just before it gets dark, when the flock will naturally return to the coop to roost. 🌿



Use chicken tunnels and portable pens to let your birds deposit their manure directly onto your garden beds.

Patricia Foreman and her hen, Oprah Hen-Free, present workshops on how chickens can help save the world (www.ChickensAndYou.com). Her book, *City Chicks*, is available at <http://goo.gl/TL8Ce>. Cheryl Long is the Editor-in-Chief of MOTHER EARTH NEWS. After losing too many free-range hens to hawks, she now uses tunnels to protect her birds, grazing them on cover crops in her garden beds.

do now is teach them how to dig deep and get the moles; our cats can't keep up! —*Ludmilla Perez*

- Guinea hens are the best **tick** control, and for **scorpion** control, bantam chickens just can't be beat. I still like bats and purple martens for mosquitoes, though. —*Zemuly Ruth Sanders*
- This is purely anecdotal, but last summer Lyme disease was bad around here. My neighbors who live 1 mile away had bad **ticks**, and both their dog and my friend's husband were infected. I only saw one tick the entire year, on the other hand, and it was early in the season (when my hens were still young). I haven't seen one since that year, not even on my dogs whose commercial tick protection has lapsed. —*Brandis L. Roush*
- We raised free-range ducks. In summer, they spent most of their time happily eating insects, including those awful **Japanese beetles**. The cornfields around us were swarming with Japanese beetles that were attacking our fruit trees. My hubby put out a bag trap to lure them away from the trees. Every day he emptied it into the watering trough, and the ducks would run over for their crunchy, swimming snacks. My parents grew up raising guineas and chickens. They told me that guineas are not only great insect eaters, but they also go after **mice**. —*Judith Drayton*
- I have about 70 free-range birds (chickens, ducks and turkeys) patrolling my

acreage for light edibles. They really do make a difference. My ducks are funny to watch chasing flying insects and keeping my 300 berry bushes free of **aphids** and **stink bugs**. The chickens are great at keeping **tick**, **grub**, **mosquito** and **grasshopper** populations down. These birds are the beneficial predators on my farm, getting the job done naturally and organically! —*Melissa Ehrman Johnson*

- We have a backyard that is in a low spot of the neighborhood. When it rains, the

Organic tick and pest control is only a free-range poultry flock away.

yard stays pretty damp, so we always had a lot of **no-see-ums**, or **midges**. After adding six hens last year, I have definitely noticed a decline in pests. Thank goodness—I can't stand those little blood-suckers! —*Gabe Simpkins*

- We used to have about two dozen hens that free ranged our 3 acres. We hardly had any **ticks**, **fleas**, **ants**, **spiders** or **mosquitoes**, and we even caught them on several occasions eating small **snakes**. —*Rachele Ruth-Hardy Tycksen*
- I fenced in my quarter-acre raspberry patch and let the chickens run. They eat **grasshoppers** and pests that threaten the

berries while fertilizing the patch. The canes protect the chicks from airborne attacks by magpies and crows. The chickens follow me as I pick the berries, and get any bugs I dislodge and berries I won't use. —*Anna Clark*

- My one free-range hen loves to eat **carpenter ants** and **termites**. I think she eats enough of them to keep us from having a problem. She does not, however, eat mosquitoes. —*Lorena McGovern*
- I found a significant drop in insects. I raised Rhode Island Reds, while my friend raised Barred Rocks, in different pens but in the same barn. I suffer arachnophobia something fierce, so it was easy to notice that **spiders** were thinning out in population. We opened the back wall of the barn to let the hens free range and noticed we weren't seeing nearly as many **grasshoppers**, and the **ants** weren't as noticeable either. One can't beat fowl for pest control! —*Thomas A. Reou*
- We've noticed that our **moles** have left our yard! (The chickens eat the **grub worms** that the moles feed on.) I love our chickens! —*Linda Johnson*
- Thanks to my chickens, along with barn swallows and small bug-eating bats, I have a greatly reduced insect population. My garden has few insects that chew up my vegetables. —*Stephanie Hanlon*
- I got guineas on my farm after finding **ticks** on my cat and goats. Since getting the birds, I haven't seen another tick on my animals. —*Nancy Barnaby Farrell*

Gardeners' Glossary of PEST CONTROL SOLUTIONS

Keep bad bugs at bay by using protective covers, handpicking, attracting beneficial insects, and applying short-lived organic insecticides only if necessary.

By Barbara Pleasant and Shelley Stonebrook
Illustrations by Linda Cook

An abundance of buzzing, hopping, fluttering and crawling insects is a trademark of any healthy organic garden. This diversity means insects that might feed on your crops are likely to be kept in check by their enemies. In small numbers, pests simply provide food for birds and ben-

eficial insects, and if your soil and crops are healthy, plants fend off the pressure easily. Only when pest populations become excessive do gardeners need to step in to restore balance to keep their gardens thriving. Keep this simple mantra in mind during your pest control efforts: Look closely. Examine your plants regularly, noting what kinds of insects you see. Observe

Place birdhouses and simple water features around your garden to invite in natural predators.



whether you see just a few of a particular kind of insect or whether populations are growing, and look up pictures of what you see so you know which are beneficial and which are detrimental. (For pictures of and detailed information about beneficial and pest insects, see our online Organic Pest Control Series at www.MotherEarthNews.com/Pest-Control-Series.)

We've separated this glossary into sections that present a three-pronged system of organic pest control: First, attract a diversity of beneficial insects by interplanting flowers and herbs—especially those that produce nectar from numerous small florets, such as mints and sweet alyssum. Second, put a variety of physical controls in place when pests get out of check or are known to be troublesome in your area (see a chart of the 15 worst garden pests on Page 48). Last, if needed, bring in organic insecticide reinforcements. The products listed in this glossary all have been approved by the U.S. Department of Agriculture National Organic Program.

Pest-Eating Beneficials

The following insects feed on other insects, helping prevent pest species from doing more than minor damage to your crops.

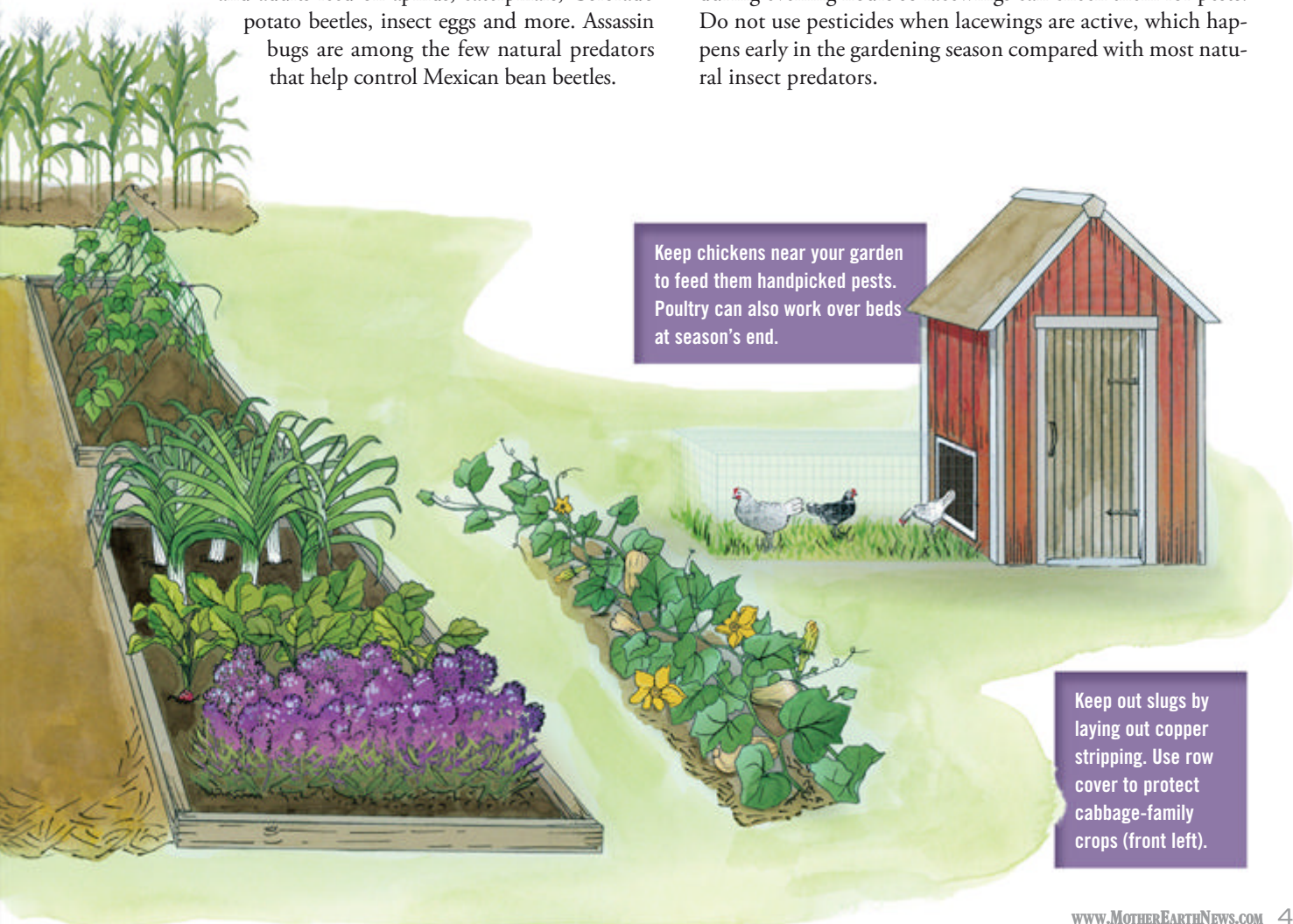
Assassin bug. These 1-inch-long predatory bugs have shield-shaped backs and are active pest hunters. Larvae and adults feed on aphids, caterpillars, Colorado potato beetles, insect eggs and more. Assassin bugs are among the few natural predators that help control Mexican bean beetles.

Braconid wasp. North America is home to nearly 2,000 species of these non-stinging wasps. Adults are less than a half-inch long, and they lay eggs inside or on host insects; the maggot-like larvae feed on their prey from inside. Braconids lay eggs on numerous pests, such as aphids, caterpillars (including cabbageworms and tomato hornworms), and leaf miners.

Ground beetle. These beneficial insects live in the soil beneath mulches, around compost piles, and in the sheltered areas below perennial plants. Some create vertical tunnels that they use to ambush and trap prey, but most ground beetles wander about aboveground, foraging for food at night. They dine on asparagus beetles, cabbageworms, Colorado potato beetles, corn earworms, cutworms and slugs.

Hover fly (aka syrphid fly). Black-and-yellow-striped hover fly adults resemble yellow jackets but are harmless to humans. Larvae are petite, tapered maggots that crawl over foliage to feed on small insects. They are aphid-eating machines and also devour mealybugs, mites, thrips, scale insects, and small caterpillars, such as cabbageworms.

Lacewing (aka aphid lion). Lacewing larvae prey on aphids, cabbageworms, caterpillar eggs, whiteflies and more. They feed for about a month, in which time each larva consumes about 600 aphids. Remove row covers from plants during evening hours so lacewings can check them for pests. Do not use pesticides when lacewings are active, which happens early in the gardening season compared with most natural insect predators.



Keep chickens near your garden to feed them handpicked pests. Poultry can also work over beds at season's end.

Keep out slugs by laying out copper stripping. Use row cover to protect cabbage-family crops (front left).

Lady beetle (aka ladybug). Lady beetle larvae and adults eat aphids, small caterpillars and insect eggs. A few species specialize in eating mealybugs, mites, scale insects and even powdery mildew. If you see adult lady beetles on a plant, look in the foliage for clusters of yellow-orange eggs, which will often be near an aphid colony. Dark-colored larvae, which resemble miniature alligators, will hatch in about a week and consume several aphids per day.

Minute pirate bug. Less than a quarter-inch long, this compact predator controls corn earworms early in the worms' life cycle. Minute pirate bugs also feed on aphids, thrips and whiteflies.

Praying mantis. The largest insect you're likely to see in your garden, this predatory species is always on the prowl, eating any other insect that moves, including crop-munching grasshoppers.

Soldier beetle (aka leatherwing beetle). You'll spy elongated, half-inch-long soldier beetles among flowers or in thick vegetation. In some areas, the larvae are key predators of grasshopper eggs, so attracting soldier beetles can provide

When pest populations become excessive, gardeners must step in to restore balance.

grasshopper control. Soldier beetle larvae eat moths, several insects, and the eggs and larvae of other beetles. Adults feed on aphids, caterpillars and other soft-bodied insects. Goldenrods, single-flowered marigolds and members of the daisy family are soldier-beetle magnets.

Spider. These eight-legged critters are probably the most abundant pest predators on your property. Any garden will likely already host several dozen types of spiders, and the most common garden spiders don't spin webs. For example, wolf spiders live in shallow underground burrows, wandering the soil's surface by night, or simply waiting by their burrow for unsuspecting prey. Perennial herbs that grow into lush bushes often make top-notch spider conservatories, and biodegradable mulches, such as straw and grass clippings, create an ideal habitat for advantageous wolf spiders. (Note that poisonous spiders don't generally favor gardens.)

Tachinid fly. Tachinid flies are gruesome parasites that glue their eggs onto an insect so that, when the egg hatches, the maggot can consume its host as food. Some species lay eggs on foliage that's food for insects, and then the eggs hatch in the insects' innards. Or, the flies inject eggs into another in-

Top 15 Worst Garden Pests

Pest	Most Susceptible Crops	Best Organic Controls
Slug	Beans, cabbage-family crops, lettuce and other greens, strawberries, seedlings of all types	Copper strips, diatomaceous earth, handpicking, iron phosphate bait, poultry
Squash bug	Summer and winter squash	Good garden cleanup, handpicking, neem, poultry, row cover, vacuum
Aphid	Beans, cabbage-family crops, peas, potatoes, tomatoes	Beneficials, oil, soap, strong sprays of water
Cabbageworm	Cabbage-family crops	Bt, handpicking, row cover, spinosad
Squash vine borer	Summer and winter squash	Growing resistant varieties, row cover, Bt injections
Japanese beetle	Beans, grapes, raspberries	Birds, diatomaceous earth, handpicking, poultry, row cover, trap-cropping
Tomato hornworm	Peppers, tomatoes	Beneficials, Bt, handpicking
Cutworm	Cabbage-family crops, pepper and tomato seedlings	Birds, collars, diatomaceous earth
Grasshopper	Beans, cabbage-family crops, carrots, corn, lettuce, onions	Handpicking, poultry, row cover
Cucumber beetle	Cucumbers, melons, squash	Handpicking, neem, vacuum, yellow sticky traps
Corn earworm	Beans, corn, peppers, tomatoes	Bt, neem, vegetable oil
Whitefly	Eggplant, okra, peppers, sweet potatoes, tomatoes	Beneficials, horticultural oil, insecticidal soap, reflective mulches, sticky traps, vacuum
Flea beetle	Cabbage-family crops, eggplant	Cultivation, row cover, yellow sticky traps
Colorado potato beetle	Potatoes	Handpicking, neem, poultry
Leafhopper	Beans, beets, eggplant, lettuce, potatoes	Diatomaceous earth, insecticidal soap, row cover

sect's body with a sharp ovipositor. Garden pests controlled by tachinid flies include armyworms, cabbage-worms, cutworms, grasshoppers, Japanese beetles, leaf rollers and squash bugs. Attract tachinid flies by growing plants that bear umbels of tiny flowers. Buckwheat, carrots, cilantro, dill, Queen Anne's lace and sweet clover are among the crops that fit this bill.

Trichogramma wasp. These gnat-sized wasps lay their eggs inside the eggs of other insects, where the young trichogramma then develop as internal parasites, breaking the host's life cycle. Common hosts include eggs of cabbageworms, codling moths and European corn borers. Trichogramma wasps are too tiny to observe in the garden; however, scientists have found that flower nectar from buckwheat and sweet alyssum enhanced wasp reproduction in lab experiments.

Wasp (stinging types). Wasps can be great garden allies because they consume huge numbers of leaf-eating caterpillars and irritating flies, which they feed to their growing larvae. Take caution if yellow jackets or hornets show up, and mark wasp nests so you can avoid disturbing them. Paper wasps are less aggressive than yellow jackets or hornets, and are happy to nest in bottomless birdhouses placed around the garden.

Physical Controls

Cleanup. Practice good garden sanitation for certain crops at season's end to disrupt the life cycle of pests that feed on those crops. After your cucumber and squash plants are spent, remove plant debris from the garden and chop it into small pieces before composting it. Do the same with asparagus, which can host asparagus beetles, and with broccoli and cabbage stumps, which can harbor cabbage aphids. If you have problems with pests that overwinter as adults, mow down any weedy areas in fall.

Copper strips. Slugs receive an unpleasant electrical jolt if they crawl over copper. Garden centers sell copper stripping that you can place around particular crops or even use to encircle entire garden beds to keep slugs out. The strips should be at least a few inches wide so slugs can't traverse them unscathed.

Cutworm collars. Push cylindrical "collars" — which can be made from small cans, yogurt cups or toilet paper rolls — into the soil around tomato, pepper and other trans-

Attract beneficial insects
and use physical controls
before you resort to
organic pesticides.

plants to protect the young plants from cutworm damage.

Handpicking. Ultra-low-tech but effective for organic gardeners, handpicking is just what it sounds like: Spot pests and squish them or brush them into a pail of soapy water (or collect them for your chickens). Keeping a close eye on your crops and knowing how to identify pests are the keys to

this method. Pests that haven't become overwhelming in number and are big enough to spot easily, such as slugs, tomato hornworms and other worm-type pests, are prime candidates for handpicking.

Poultry. Insect-munching fowl will devour practically any insect that moves, including ticks, grasshoppers, Colorado potato beetles, slugs and more. Ducks are reportedly sharp slug-spotters, whether you let them work over the garden in spring and fall or enlist a pair as your assistants throughout the season. Chickens work best in winter, because their scratching can damage crops during the growing season. (Go to <http://goo.gl/APWGuG> for reader reports about how to most effectively control pests with poultry.)

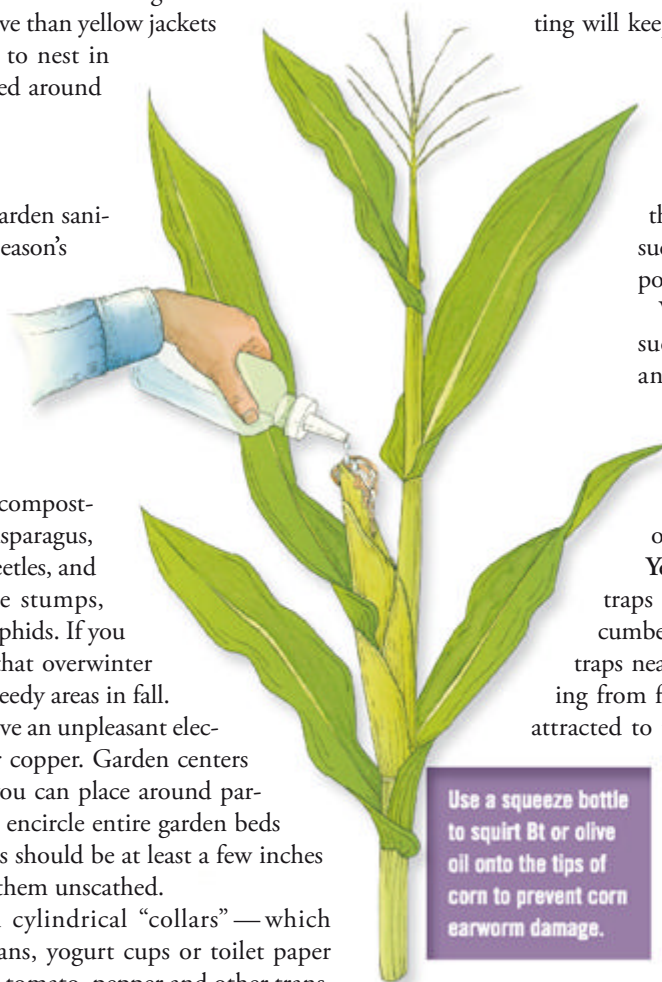
Row covers. A lightweight row cover or tulle netting will keep some crops pest-free. Cover your cabbage patch in this way, along with other cabbage-family crops, to keep cabbageworm moths from laying eggs on your plants. Use hoops or blunt stakes to hold up the covers. Remove covers after crops, such as squash, begin to flower, so that pollinators can reach the flowers.

Vacuum. Some gardeners report successfully controlling squash bugs and other pests by sucking them up with a shop vacuum. Got poultry? Empty the vacuum bag into their pen and everybody wins — except the pests, of course.

Yellow sticky traps. Hang flat, sticky traps near cucumber plants to catch cucumber beetles. To snare flea beetles, place traps near eggplants and other crops suffering from flea beetle pressure. These pests are attracted to the color of the traps and will get caught in the goo.

Organic Insecticides

Bt (*Bacillus thuringiensis*). This naturally occurring bacterium kills caterpillars when they eat leaves that have been sprayed with it. Armyworms, cabbage-



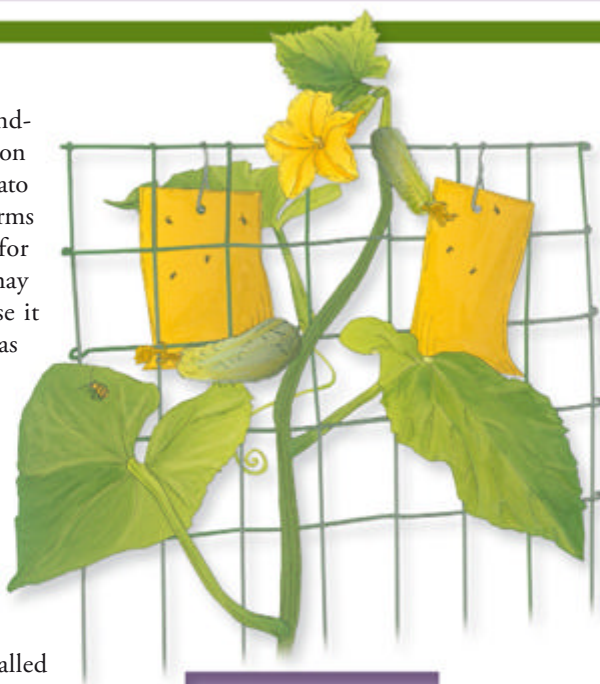
worms, corn earworms, diamond-back moths, grape leaf rollers, melon worms, tomato fruitworms, tomato hornworms, and various webworms and budworms are candidates for Bt treatment. Butterfly larvae may also be killed by Bt, so don't use it on butterfly host plants, such as parsley. Additional strains of Bt include one that kills mosquito larvae and one that is toxic to Colorado potato beetle larvae. Sunlight degrades Bt after a few hours, so apply it late in the day. Reapply after heavy rain.

Diatomaceous earth (DE).

A powder made from fossilized remains of aquatic organisms called "diatoms," DE has sharp edges that cut into insects' bodies and cause them to die of dehydration. DE is less effective when wet, yet can still be used in the garden to make life difficult for flea beetles and newly emerged cutworms and Japanese beetles. In dry weather, DE spread beneath plants will repel slugs. Lightly sprinkle dry DE on the soil's surface where Japanese beetles, slugs, or other pests will come into direct contact with the dry particles. Renew after rain or dew.

Horticultural oils. When applied directly to pests, horticultural oils interfere with respiration, causing insects to suffocate and die. These oils help control aphids, whiteflies and other pests, but can also kill beneficial mites and injure the leaves of some plants. Frequent use can reduce yields even when the pest is under control. Best applied in cool weather, horticultural oils are valuable allies in organic orchards, where they can control pests that overwinter in bark crevices.

Insecticidal soap. Fatty acids in insecticidal soaps break down the protective cuticles of soft-bodied pests, such as aphids, which will then quickly become dehydrated and die. Soap sprays have no residual effect and only kill insects that are sprayed directly. Thoroughly wet both sides of leaves and the insides of all crevices. Repeat applications may be needed every week as new aphids or whiteflies hatch and form colonies. To make soap sprays at home, mix 1 tablespoon of



Snare cucumber beetles by hanging a couple of yellow sticky traps on your cucumber trellis.

dishwashing liquid per quart of water. Purchased insecticidal soaps are purer, however, and less likely to injure foliage. Frequent soap sprays may reduce the yields of some crops. Use soft or rainwater when diluting soap concentrates.

Iron phosphate slug bait.

Sprinkle slug-bait granules evenly throughout your garden beds, and slugs will eat it instead of your plants, then crawl off to die. The bait is nontoxic to pets and humans. Sluggo is a popular brand of this type of bait.

Neem. When applied to insects and the plants they eat, neem oil, which is derived from an Asian tree, causes many insects to feed less, grow more slowly, molt less and stop laying eggs. Neem works best on young insects, particularly those that grow rapidly, such as Colorado potato beetles, Mexican bean beetles and squash bugs. Neem can also control aphids and leaf-

eating caterpillars.

Pyrethrum. One of the oldest known pesticides, fast-acting pyrethrum is also the strongest insecticide allowed under U.S. National Organic Standards, so use it only after you've exhausted other methods. Insects, including beneficials, typically become paralyzed as soon as they come into contact with pyrethrum, which is made from the dried flowers of the daisy

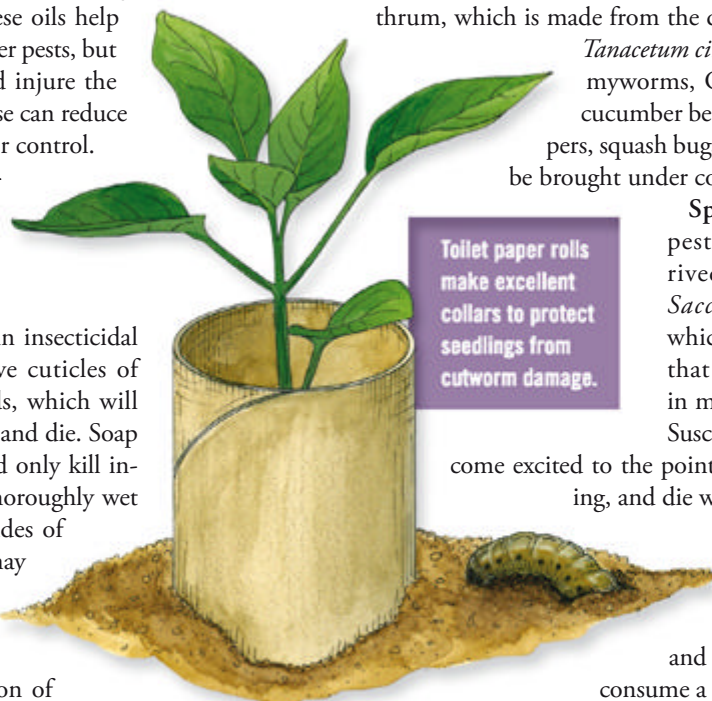
Tanacetum cinerariifolium. Aphids, armyworms, Colorado potato beetles, cucumber beetles, cutworms, leafhoppers, squash bugs and whiteflies can often be brought under control with pyrethrum.

Spinosad. A biological pesticide, spinosad is derived from the bacterium *Saccharopolyspora spinosa*, which produces a substance that works as a neurotoxin in many (but not all) insects.

Susceptible insect species become excited to the point of exhaustion, stop eating, and die within two days. Spinosad

controls all types of caterpillars, Colorado potato beetle larvae and blister beetles,

and works best on pests that consume a lot of leaf tissue. 🌱



Toilet paper rolls make excellent collars to protect seedlings from cutworm damage.

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PLANT POLLINATION PRIMER

Get the facts on how insects and wind pollinate your crops so you can plant smarter and haul in heftier harvests.

By Barbara Pleasant
Illustrations by Elayne Sears

As humans, it's hard to imagine sex without the ability to move, which is the fundamental challenge of plant pollination. To make seeds, reproductive cells (called "gametes") from separate male and female cells must join, often from separate flowers and sometimes from separate plants—but the plants can't move to help make the miracle happen. Instead, they rely on the resources around them: wind, insects, birds and, sometimes, people.

Understanding plant pollination is more crucial than ever, as we are in the midst of a severe decline of native pollinators because of ubiquitous pesticide use in monocrop agriculture. While we may not be able to change this unsustainable practice overnight, we *can* make some changes in our own backyards to bolster pollinator populations and, in turn, our harvests.

Numerous factors that influence successful pollination are within a gardener's control, including planting in certain arrangements, using organic methods, encouraging wild pollinators and, when need be, actively intervening with hand pollination. The benefits of better pollination can be huge with crops that are eaten as mature, seed-bearing fruits, such as berries, corn, cucumbers, tomatoes and tree fruits.

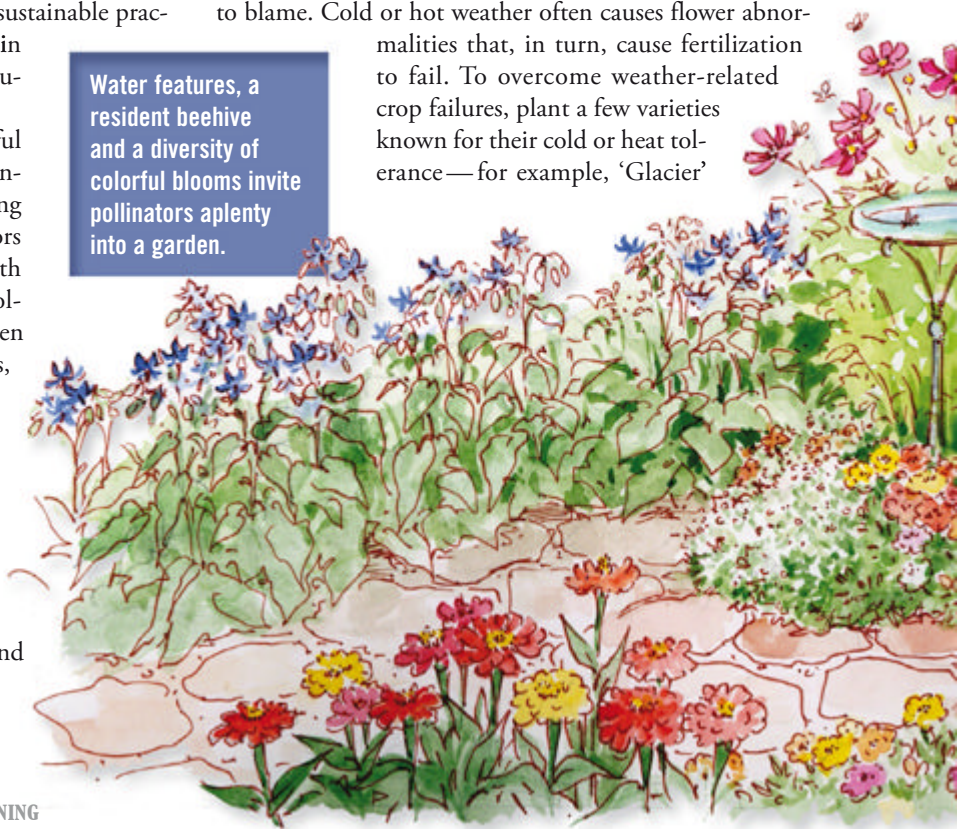
Like most plants, food crops have sophisticated reproductive systems in place, ready to take on the pollination gamble. Delicate female parts are hidden inside the flower, safe from the elements. Plant pollen faces an out-in-the-open, hostile journey—even with a waxy coating and a stash of carbs for energy, male pollen grains must quickly find their way to a receptive female organ. There, they grow a tube that unites them with the ovary, thus forming a fertilized seed.

Self-Fertile Plants

Beans, peas and tomatoes are examples of species that are "self-fertile," which means that all the necessities for successful pollination reside within each flower. A bit of well-timed shaking is all that's needed to sprinkle pollen grains where they need to go, which in nature is done by wind and visits by buzzing insects. For example, bean blossoms offer no nectar, but a bumblebee can shake out a pollen reward by giving them a good buzz.

When beans, peas and tomatoes bloom but set no fruit, the weather—not a lack of pollinating insects—is usually to blame. Cold or hot weather often causes flower abnormalities that, in turn, cause fertilization to fail. To overcome weather-related crop failures, plant a few varieties known for their cold or heat tolerance—for example, 'Glacier'

Water features, a resident beehive and a diversity of colorful blooms invite pollinators aplenty into a garden.



and 'Tropic' tomatoes. These are more likely to set fruit successfully under conditions that would cause a sensitive variety, such as 'Mortgage Lifter,' to shed most of its blossoms.

Insect Pollination

To produce fruit, about 35 percent of food crops require repeat visits by insect pollinators, such as bees, wasps, butterflies, flies and beetles—any creature that will crawl into the blossom, transfer pollen from the male anthers to the

The blossoms of some self-fertile crops, such as beans and tomatoes, benefit from a good "buzz" from pollinators, such as bumblebees.

Plant corn and other wind-pollinated crops in large blocks instead of in rows to achieve adequate pollination and a good harvest.

female stigma, and then move on to do the same to another flower. The pollen grains of insect-pollinated crops are sticky for easy transport, and many plants advertise for pollinator services with colorful flowers—visual billboards promising a sweet drink of nectar, some nutritious pollen and occasionally a safe place to sleep. Case in point: Male squash



bees hide away inside bright orange squash flowers late in the day, and then the blossom closes up around the sleeping bees as night falls, protecting them from predators. Inside, the bees' movements ensure that pollen spreads throughout the flower and all over the bees. In the morning, the guys are rested and the squash flowers are nicely pollinated.

Most flowers have not one but dozens—or even hundreds—of ovaries that need to be fertilized, so pollination usually takes place over two to three days. In any seed-bearing fruit or vegetable, each seed represents a fertilized ovary. All the little seeds on strawberries result from 16 to 25 visits by pollinating insects. In comparison, because of differences in flower design, only half as much pollinator activity is needed to produce a watermelon containing hundreds of ripening seeds.

We recently asked the MOTHER EARTH NEWS Facebook community to dish on pollinator activity in their gardens. People with beehives (or, in the northernmost United States, more cold-hardy mason bee boxes) said pollination couldn't be better, and gardeners who went out of their way to grow borage, catnip and other bee-friendly flowers also report-

All the little seeds on strawberries result from 16 to 25 visits by pollinating insects.

ed ample buzzing in their gardens. Alarming, however, many long-term growers from about a dozen different states reported seeing fewer and fewer bees and other pollinators year after year. Some said they have been forced to hand-pollinate squash in recent years in order to get a harvest.

Find detailed techniques for encouraging native pollinators in "How to Attract Native Bees to Your Organic Garden," online at <http://goo.gl/dFQ3Zx>. The most effective strategy is simple: Grow as many nectar-producing flowers, such as goldenrod and milkweed, as you can fit into your garden, because pollinators can't resist the sweet, nutritious treat of nectar.

Wind Pollination

Wind-pollinated plants don't need insects to move pollen to where it needs to go. Instead, they produce large amounts of smooth, dry pollen grains befitting of air travel. Corn, wheat, and other grains and grasses are primarily wind-pollinated, as are crops in the spinach family. Pollination won't affect your spinach harvest because you'll eat only the leaves—but it would affect any seed-saving efforts.

Troubleshoot Plant Pollination Problems

The crop groups below are ready for harvest after seeds have set, so good pollination has a direct effect on the size and quality of the harvest.

Plant Family	Pollination Type	Effects of Inadequate Pollination	Gardener Interventions
Beans	Self-fertile; in some varieties, buzz pollination from insects will increase pod size and number of seeds.	Flowers come and go, but few pods develop.	Time plantings so plants don't bloom in high heat. Vibrate blossoms or gently shake plants to mimic visits by bumblebees.
Corn	Wind-pollinated, with some minor assistance from insects that knock pollen from the tassels.	Ears are stubby, with many missing kernels and no kernels near the tip.	Plant in large blocks if possible. For small plantings, tap pollen from tassels onto silks each morning for a week.
Cucumbers and squash	Insect-pollinated; male and female parts are located on different flowers; some cukes produce self-fertile female flowers.	Fruits shrivel when young, starting at the blossom end.	Grow flowers to attract native pollinators. Hand-pollinate by transferring pollen from male to female blossoms.
Strawberries	Pollinated by bees, flies and other insects as they crawl about on the flowers.	Berries don't develop fully; they're small and puckered.	Grow flowers to attract native pollinators. Hand-pollinate berry blossoms with a feather or dry paintbrush.
Tomatoes and peppers	Self-fertile; buzz pollination will improve fruit set and size.	Plants develop angular, hard-sided fruits with dry pockets inside where seeds should be.	Grow bumblebee-attracting plants. Vibrate blossom clusters to mimic visits by bumblebees. Grow cold- or heat-tolerant varieties if needed in your climate.
Tree fruits	Wind- and insect-pollinated; insects are essential to pollinate trees that don't produce self-fertile blossoms.	Few fruits set, fruits are small and slow to ripen, or fruit only grows on isolated branches.	Plant more than one variety for species that require cross-pollination. Grow flowers to attract native pollinators. Hand-pollinate with a tuft of dry feathers on a stick.

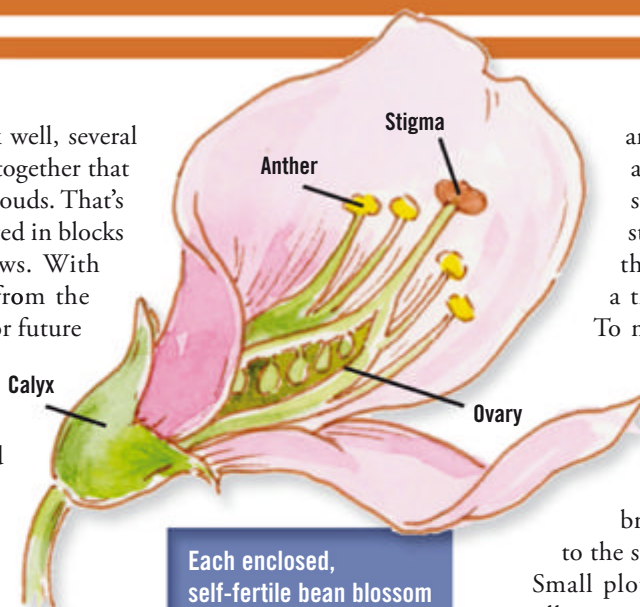
For wind pollination to work well, several plants must grow close enough together that pollen gets released in drifting clouds. That's why corn should always be planted in blocks rather than in long, single rows. With corn, every silk that emerges from the tip of the ear leads to an ovary, or future kernel. To form a well-filled ear, fresh pollen grains must land on hundreds of silks and then successfully germinate and grow long tubes to hundreds of receptive ovaries. Rather than risk a poor harvest, many gardeners with small corn plantings hand-pollinate to make sure they get completely developed ears.

Wind-pollinated crops are susceptible to pollen pollution—for example, when pollen from field corn blows into plantings of sweet corn. Organic growers in commercial farming areas face the inflow of pollen from genetically modified corn. Windbreaks composed of trees or hedges of tall sunflowers or sorghum can reduce incoming alien pollen, as does a planting distance of several hundred feet. Also try planting times that are at least two weeks earlier or later than those of nearby commercial farmers.

Hand-Pollination Tips

In small gardens, pollination of many crops may fall short because of too few insect-attracting flowers. If, for example, you have fewer than four plants of a cucurbit cousin—such as cucumbers, squash and pumpkins—or only a small plot of corn, you can greatly improve fruit set by performing simple hand-pollination techniques. Hand pollination is also helpful in areas where drought or pesticides have led to a shortage of insect pollinators.

A dry paintbrush or a feather is the only tool you'll need to hand-pollinate strawberries and other plants that insects normally pollinate. For such crops, a few dabs with either implement will transfer pollen from the male to the female parts of each flower. For cukes



Each enclosed, self-fertile bean blossom contains male (anther) and female (stigma) reproductive parts.

and squash, you'll need to gather a few newly opened male blossoms (which are borne on bare stems) and touch the pollen to the female flowers (which have a tiny round fruit at their base). To mimic bumblebees' buzz-pollination of eggplants, peppers or tomatoes, hold the blossom or blossom cluster and then touch the back of a vibrating toothbrush or a bladeless electric razor to the stem for a few seconds.

Small plots of sweet corn will produce excellent ears if they're hand-pollinated in the mornings, when pollen is fresh and silks are stickiest. Doing so requires no special equipment. Every day for a week, just pinch off pieces of tassel from the top of the plant

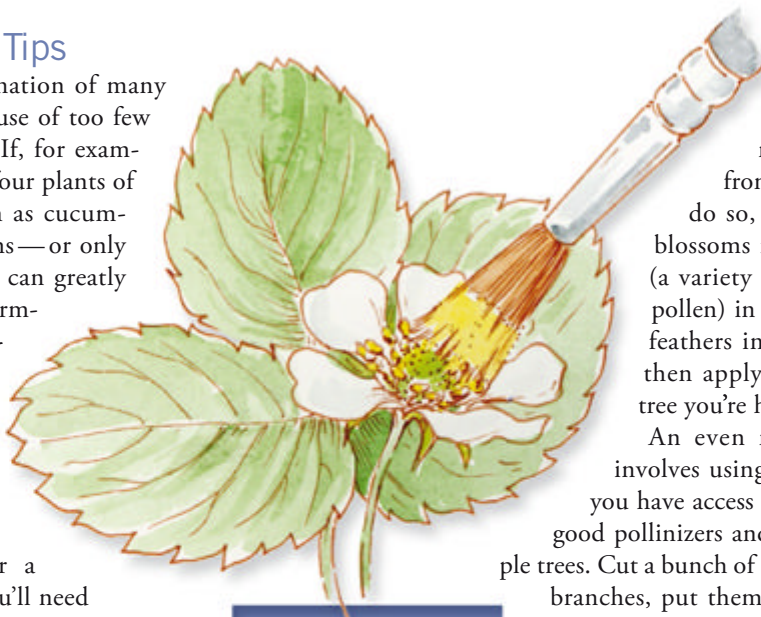
and tap them over the moist, new silks of emerging ears. Do this when the tassels are fully open and beginning to shed yellow pollen. Or, on still mornings, give the stalks a sharp thump with your hand to release pollen.

Hand pollination of tree fruits is tiresome but worthwhile. You can use a tuft of feathers attached to the end of a long stick to tickle each blossom cluster, branch by branch. Repeat daily for

a week. For plant species that are not self-fertile, such as most apple trees, you'll need to move pollen from one tree to another. To

do so, gather excess secondary blossoms from a pollinizer variety (a variety that produces sufficient pollen) in a paper bag, and dip the feathers in the bag of blossoms to then apply to the blossoms of the tree you're hand-pollinating.

An even more efficient method involves using crab apple blossoms, if you have access to some. Crab apples are good pollinizers and can pollinate other apple trees. Cut a bunch of blossom-laden crab apple branches, put them in a 5-gallon bucket of water, and then place the bucket inside the canopy of another apple tree. Bees will visit the delicious crab apple blossoms and transfer the pollen to your apple blossoms, resulting in a better harvest. 🍏



You can use a small, dry paintbrush to hand-pollinate a petite strawberry patch.

GARDEN TRANSPLANTING

Expert Advice

Follow these four simple steps to help your seedlings make a smooth transition from pot to garden.

By Barbara Pleasant
Illustration by Robin Wimbiscus

Starting your seedlings indoors, or purchasing greenhouse-grown transplants from your local garden store, can give you a head start that will add weeks to your growing season. This practice can make or break a crop if you live where summers are short, or in a climate where midsummer heat leads to a meltdown of cool-natured plants.

Growing your own seedlings indoors is easy and fun because you can try vegetable varieties rarely offered at garden centers, and start them under pest-free conditions (see “Seed Starting Made Simple,” Page 37). But take some time to “harden off” transplants before setting them out in your garden.

1. Harden Off Plants

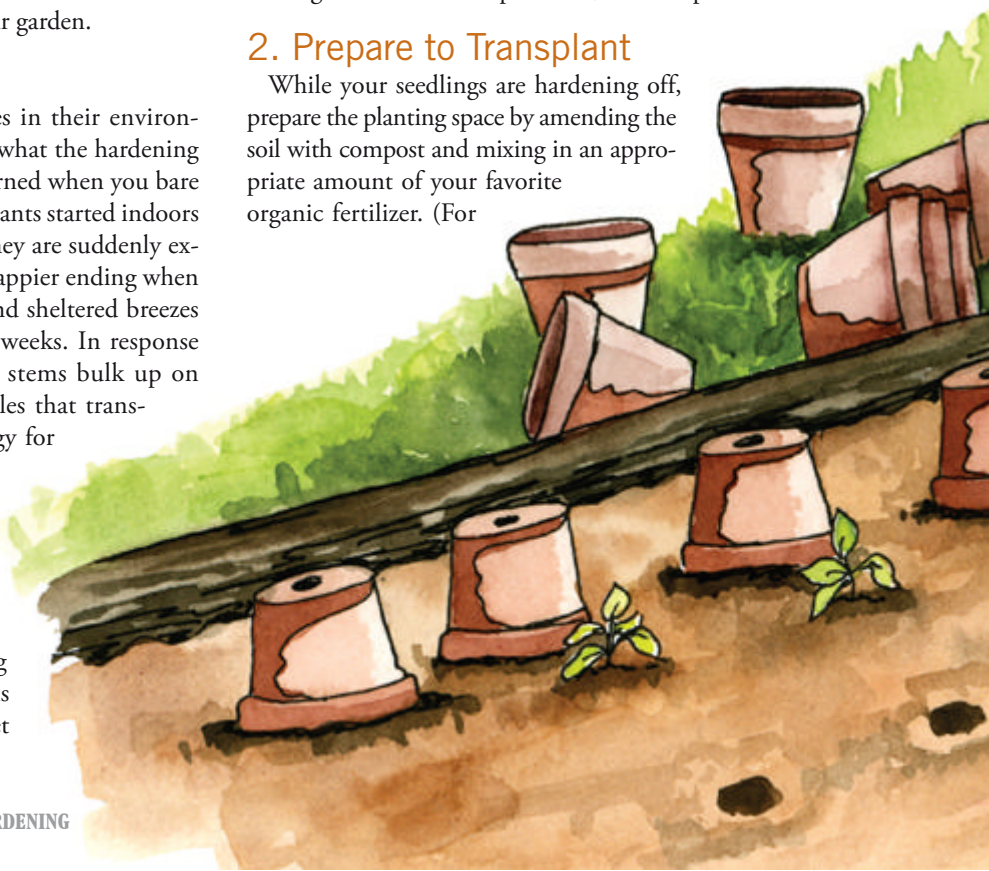
Plants adjust to small, gradual changes in their environment better than sudden shifts, which is what the hardening off process is all about. Just as you get burned when you bare your untanned skin to the sun, leaves of plants started indoors will develop pale, sunburned patches if they are suddenly exposed to too much sun. The story has a happier ending when you introduce seedlings to bright light and sheltered breezes gradually, over a period of one to three weeks. In response to more abundant light, the leaves and stems bulk up on chloroplasts—the mighty green organelles that transform light and carbon dioxide into energy for the plant. Much of that energy is sent to the main stem, which suddenly needs to get tough enough to twist and bend without breaking when blasted by wind. You may not see much new growth while plants are hardening off. But don't worry; they are busy growing and rearranging exactly the kinds of cells they will need to prosper after they are set free in the garden.

This period of adjustment can take place on your deck or patio, within a protected enclosure out in the garden, or a little of both. For example, you might begin by setting your seedlings outside in a sheltered spot for two hours one day, and four hours the next, gradually increasing light and air movement levels until the babes have made it through several days and nights in the outdoor world.

If you are away from home all day, put the plants in a location that will receive early morning sunlight and be shaded as the sun's position changes late in the morning. Watch your seedlings closely for signs of drying out, and be ready to shift them to larger containers if you see roots sneaking out of the drainage holes. If frost is predicted, take the plants inside.

2. Prepare to Transplant

While your seedlings are hardening off, prepare the planting space by amending the soil with compost and mixing in an appropriate amount of your favorite organic fertilizer. (For



one strategy, see “Free, Homemade Liquid Fertilizers” online at <http://goo.gl/BRfRW>.) Both additions energize the soil’s food web, so that seedlings slipped into planting holes will be met by a welcoming committee of root-friendly fungi, bacteria and water-soluble nutrients. Some plants form stronger alliances with soilborne microorganisms than others, but soil scientists think that all plants take up nutrients and resist diseases better when they have strong relationships with life-forms that flourish in the rhizosphere—the fertile real estate where root and soil come together. Mixing at least a handful of compost into the bottom of planting holes used for vegetable seedlings helps these partnerships fall into place quickly.

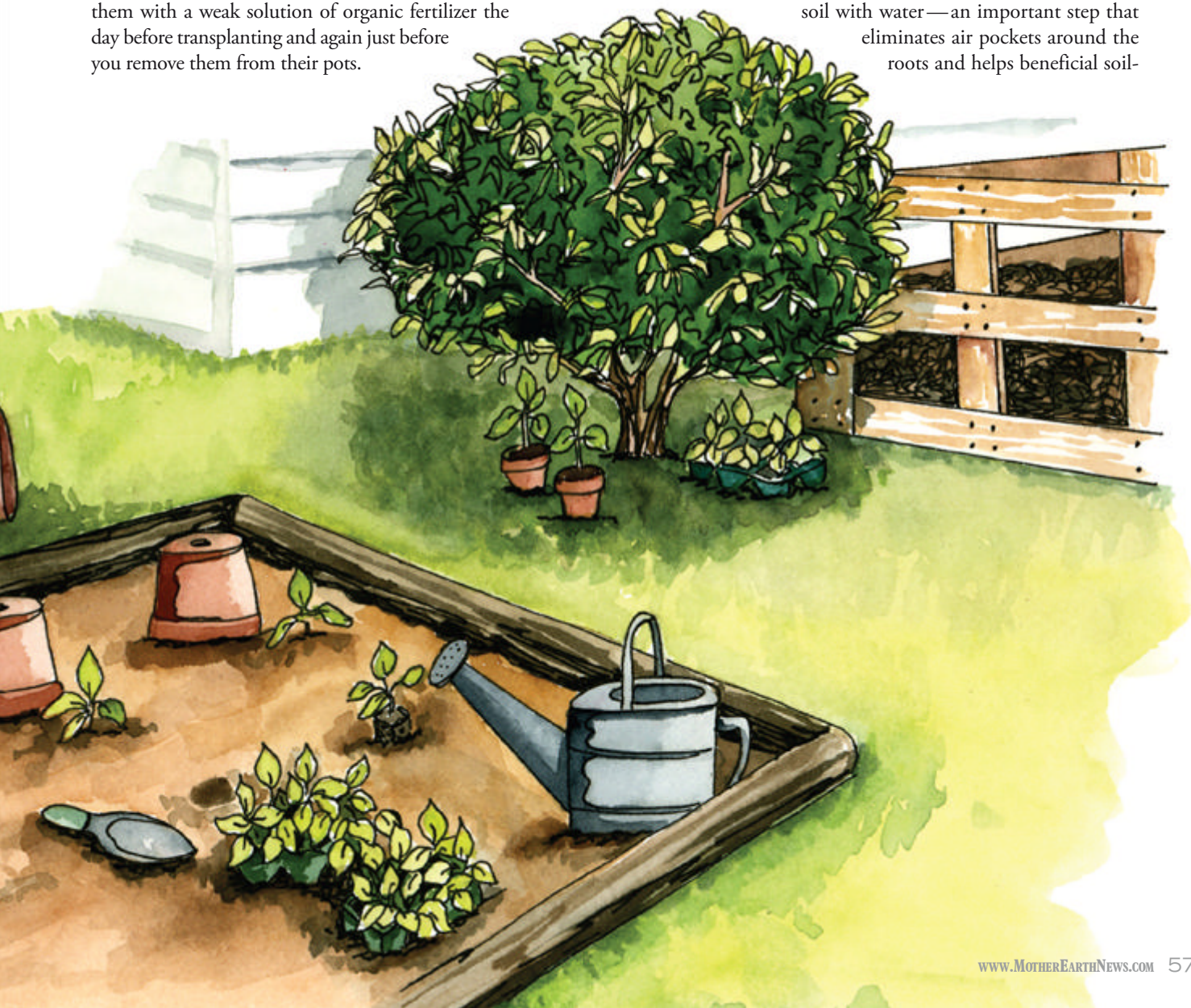
When the plants have been hardening off for at least a week, and the soil is ready to receive them, check your weather forecast. Soil temperatures should be to the plants’ liking, and it’s helpful to have some cloud cover or light rain during the first few days after transplanting. Delay transplanting if a heat wave is on the way, or if the soil is clammy and cold. Meanwhile, make sure the little plants are well-hydrated and amply fed. Drench them with a weak solution of organic fertilizer the day before transplanting and again just before you remove them from their pots.

3. Handle with Care

Nature occasionally transplants a broken stem to a moist spot where it takes root and grows, but she never lifts, handles and replants six-week-old seedlings! To make this bizarre adventure more acceptable to plants, push them out of their containers from the bottom rather than pulling them out by their stems. In most cases, you can place one hand over the container with the main stem between your fingers, tip it over and shake or tap to loosen the root ball. If necessary, pry roots loose using a knife. Handle the freed plant by its root ball (a large spoon is great for this), and avoid touching the main stem. As you set the plant in its permanent home, use the lowest leaves as handles. Should they break off, it’s no big deal.

As a general rule, it’s best to keep as much soil packed around the root ball as possible. Exceptions are seedlings whose roots have grown into a solid mass. To encourage these frustrated roots to grow outward into surrounding soil, you should use a fork or your fingers to tease out a few outer roots.

Finish the transplanting process by drenching the soil with water—an important step that eliminates air pockets around the roots and helps beneficial soil-



borne microorganisms move into the plant's rhizosphere.

4. Cover Plants

Nicely hardened-off seedlings transplanted in perfect weather (mild, cloudy and still) can fend for themselves, but great transplanting weather seldom lasts long enough. To be safe, temporarily shield transplants from sun and wind by covering them for at least two days after transplanting. Increase to four or five days if the weather is very sunny, windy or cold, or if the plants' roots were damaged as you set them out. For example, if you found three plants rather than one in a purchased pot of basil, and you separated them as you set them out, covering the plants for four days or more after transplanting can make the difference between success and failure.

You can use upturned flowerpots, cardboard boxes or buckets as plant covers. In hot weather, opt for a piece of lightweight cloth held aloft with stakes. Remove the covers after a few days, and then pat yourself on the back for a job well done. After all, one of the huge differences between people and plants is that we are built to move around, while a plant's

The Seaweed Solution

Many gardeners and market growers use kelp-based fertilizers to help transplants get off to a fast start. Most of these products are made from *Ascophyllum nodosum*—a brown, ribbon-like seaweed, often seen attached to a floating bladder—that grows in cold ocean water. Kelp contains growth hormones that encourage root formation, as well as 60 or more micronutrients. In addition to applying kelp mixed with water to the roots of transplants as they are set out, many gardeners report that drenching plant leaves with seaweed (or combination seaweed/fish emulsion sprays) every three weeks results in healthier, more vigorous plants. Some products are not organic because of how they are manufactured, but more than 30 kelp-based products approved for use by organic growers are listed by the Organic Materials Review Institute (www.OMRI.org).

idea of a great life is to stay in one place. For plants, good transplanting practices soften the transition from life confined in a pot to life in a garden. For people, they open the door to earlier harvests and a more successful garden. 🌱

Contributing Editor and gardening expert Barbara Pleasant is passionate about using “found items,” such as milk jugs and cardboard boxes, in her vegetable gardens to protect tender new transplants.

Want to Grow More Food? MOTHER Has Apps for That.

All the gardening info you need is available on these apps that are as mobile as you are. For more information, go to www.MotherEarthNews.com/Apps.

Tomato lovers, get ready to have some fun! Our new **Tomato Chooser** app for iPhone allows you to browse and sort through 333 tomato varieties. You can filter the varieties by color, size, time to maturity, disease resistance, growth habit (determinate vs. indeterminate) and more—making your discovery of the perfect varieties for your garden a snap. Click on any tomato you're interested in to see its photo and full profile, including quotes and flavor ratings from esteemed tomato experts. You're bound to become totally tomato-obsessed after spending time with this

app. \$1.99 in the Apple App Store; www.MotherEarthNews.com/Tomato-Chooser.

When to Plant provides the best planting times for almost 200 vegetables, herbs, fruits, cover crops and common companion planting flowers. By using your ZIP code and a database of almost 5,000 weather stations across North

America, this iPhone and iPad app locates your average frost dates and calculates the best range of planting dates for each crop.

This app is a helpful tool for spring, summer and fall planting. You can specify that the app recommend separate spring and fall planting times for cool-season crops in areas with hot summers or long growing seasons. \$1.99 in the Apple App Store; www.MotherEarthNews.com/When-To-Plant-App.

Grow Planner, Version 2 is now available in a sleek new design for iPhone as well as iPad. *Grow Planner* makes it easy to plan your vegetable garden—just sketch out your growing area, add plants, then arrange and rearrange them in the perfect layout. No other tool on the market offers this kind of functionality.

As each crop is added, the app automatically spaces the plants and calculates how many you can fit into the area you specify. *Grow Planner* enables you to add plants in rows, blocks, raised beds or using the square-foot gardening method, whatever the size or shape of your beds.

Grow Planner uses an extensive database of about 200 plants and nearly 5,000 weather stations, drawing data from across the United States and Canada to calculate recommended planting times for your specific ZIP code. Link it to an online account and receive planting reminders for your own crops delivered by email twice a month. You can quickly share plans by email or on popular social networks. \$7.99 in the Apple App Store.





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BEST SUMMER COVER CROPS

Sow these four fast-growing, weed-suppressing soil builders in any patch possible, even during your prime gardening season.

By Harvey Ussery



No gardening practice yields as many benefits as cover cropping, and growing cover crops *in every season* is as important as producing vegetables for your table. We too often think gardening reduces soil fertility, but in fact, the more you keep live plants growing, the richer your soil will become. Roots exude substances that feed beneficial soil organisms, including the amazing mycorrhizae (learn more online at <http://goo.gl/zuSdaF>). Deep-rooted plants draw minerals from subsoil, which makes the minerals available to shallow-rooted crops. Dead plants, including invisible roots, decompose and release nutrients for use by subsequent crops. Plants also prevent soil erosion, and decomposing roots open channels for oxygen and rain, and provide pathways through which earthworms and other important organisms can migrate. Repeated seasons of organic matter deposition will increase soil carbon, or “humus,” which is crucial to soil fertility, friable texture and water retention.

The ecological benefits of cover cropping go beyond soil improvement: Cover crops scavenge nutrient surges in soil that result from tilling in fresh plant matter or manure. They also prevent runoff pollution and “bank” excess nutrients for later crops. These beneficial covers boost biological diversity in and around gardens, a key to naturally preventing plant diseases and insect damage. Plus, many cover crops perform double-duty as forage for poultry and livestock, making a homestead less dependent on purchased inputs.

Too often, gardeners practice cover cropping only in the off-season—for instance, to protect soil in winter—and assume it’s not a summer option. But it is, and planting summer cover crops provides big payoffs.

Unique Challenges

Drought and heat. Drought is more likely in summer, so gardeners must choose cover crop species that



Sow a patch of cowpeas to set nitrogen between spring and fall plantings (left), and then cut the crop to form an excellent mulch (right).

not only thrive in heat but are also drought-tolerant. Hot, dry soil is also inimical to seed germination, so no summer cover is likely to succeed without a little loving care.

If you broadcast seeds, first work them into the soil, then tamp the soil down with a rake. Even better, drill the seed by hand: Open closely spaced furrows with the corner of a hoe, dribble in seed, cover and tamp. Water immediately and as often as needed to keep the top quarter-inch of soil damp until germination. After plants become established, apply a light mulch to cool the soil and conserve moisture. You can also take advantage of shade offered by an existing crop, such as spring-planted broccoli, by seeding a cover crop into the same bed a couple of weeks before you remove the main crop. Most cover crops are adapted to close planting—the closer you plant, the sooner a tight, shading canopy will form.

Limited space. The greatest difficulty with summer cover cropping is revealed by the first question every gardener asks: “We’re already pushing the garden for maximum production—where do we find any unused space?” First, try hard to dedicate at least one bed in your rotation to growing a cover crop through an entire summer season, or maybe even a whole year. You’ll be amazed by how much an uninterrupted year under cover will do for your soil—and your future crops.

A couple of ways to sneak in more cover cropping: Gaps between early and late crops are opportunities to avoid the bane of

any garden—bare soil—provided your chosen cover crop grows quickly (keep reading for suggestions). You can also interplant low-growing covers at the base of tall crops—such as trellised tomatoes or pole beans—to achieve all the benefits of cover cropping and avoid any wasted bed space.

Unique Benefits

Abundant biomass. In summer, large yields of biomass are typical, especially if you cut the cover crop during its vegetative stage to encourage rapid regrowth. You can work this surplus biomass into the soil or use it as livestock feed, compost fodder or mulch. Although overwintered covers provide those same benefits, summer cover crops yield a wider range of home-produced feeds for poultry and livestock, including cut-and-come-again greens, grains and seeds, and dried cover crops used as hay.

Weed suppression. Summertime is prime weed time, and fast-growing summer cover crops suppress weeds. They’re especially useful for filling that blank spot between early and later crops—space that would otherwise offer a field day for weeds.

Biodiversity boost. Summer covers make greater contributions to biodiversity because insects, birds and amphibians feed and reproduce during the growing season. Biodiversity creates ecological balance that can help mitigate plant diseases and damaging insects.



Fast-growing buckwheat forms a dense cover that shades out weeds (left), and the crop’s blooms bring in bees and other beneficial insects (right).

Let's consider four summer cover crops that best rise to the challenge of warm summer conditions and offer a broad range of benefits, especially in mixed plantings. All four crops will die down into a protective mulch as freezing temperatures set in.

Buckwheat

This broadleaf annual's greatest virtues are extremely rapid growth and profuse flowering. Its greatest limitation, extreme sensitivity to frost, can actually be turned into an advantage.

Buckwheat can form a tight canopy within two weeks, outstripping and shading out weeds. Its weed-suppressing prowess offers a responsible alternative to toxic herbicides. Tillage plus back-to-back successions of buckwheat have proved effective at suppressing even tough perennial weeds.

For preventing soil's exposure to baking sun, buckwheat may be the best of all covers to fill a gap between early and later crops. Plant buckwheat after all danger of frost has passed and make additional plantings anytime, up to 35 days before frost. Buckwheat flowers early (30 days from seed to bloom in my northern Virginia garden) and profusely, encouraging honeybees and other beneficial insects. Increase biomass yield by cutting the crop just before it reaches 25 percent bloom. Regrowth is rapid and a second such cutting may be possible. Plants make good fodder for poultry or rabbits, and chickens *love* buckwheat seeds: Just toss cut stems with seedheads to your flock.

Buckwheat's vulnerability to frost makes it a useful "nurse" for fall-planted, cold-tolerant crops, such as alfalfa and winter greens, which are often difficult to germinate in late-summer heat. The quick cover of some buckwheat sown with a winter crop will shade and cool the soil. The cold-hardy crop will grow in buckwheat's shade until a killing frost mows down the buckwheat, freeing the other plants for a surge of growth before winter dormancy.

Sorghum-Sudangrass

Hybrid crosses of forage-type sorghum and sudangrass yield



In small plots, you can cut cover crops with a hand sickle.

On this farm, allelopathic sorghum-sudangrass is grown in alleyways to suppress weeds and produce fodder for compost, while cowpeas fix nitrogen in the space to be followed by food crops.

dramatic improvements to soil texture and increases in organic matter. Strains of sorghum-sudangrass grow 5 to 12 feet tall and produce an impressive amount of biomass. Cut back to 6 inches when the crop reaches 4 feet high to stimulate regrowth and encourage deeper, more aggressive root growth for opening compacted soil. The cut stalks make long-lasting mulches.

Plant sorghum-sudangrass about two weeks after the date for planting sweet corn in your area and anytime thereafter until six weeks before frost; it thrives in summer heat. After it's established, sorghum-sudangrass is highly drought-resistant.

If planted tightly—in rows spaced 8 inches apart and seeds at 1.5 inches apart, planted 1 inch deep—sorghum-sudangrass will beat out weed competition. Allelopathic compounds exuded from this crop's roots will suppress damaging nematodes and inhibit many sprouting weeds and crop seeds. However, this means gardeners should wait six to eight weeks after killing sorghum-sudangrass before sowing another crop in the same spot.

Sorghum-sudangrass makes good livestock forage, though you must not feed your animals young plants (those less than 24 inches high) or those stressed by drought or killed by frost, which may cause prussic acid poisoning. Ducks and geese love the leaves, and goats eat the stalks like candy.

RESOURCES

COVER CROP SEEDS

Find all four summer cover crops at Peaceful Valley Farm Supply (www.GrowOrganic.com), along with a cowpea inoculant to assure nitrogen fixation in the cowpea and hemp legumes. Use the Seed and Plant Finder to locate additional sources of cover crops (www.MotherEarthNews.com/Custom-Seed-Search).

The only source for nontoxic Certified Organic 'Tropic Sun' sunn hemp seed is the Molokai Seed Company in Hawaii (www.MolokaiSeedCompany.com).

MORE HOW-TO

"The Joys of Cover Cropping" provides an excellent introduction to cover crops (go to <http://goo.gl/W7jDFs>).

The 244-page compendium *Managing Cover Crops Profitably* (third edition) is indispensable for gardeners as well as farmers. Published by the Sustainable Agriculture Research & Education Program (SARE), the book can be ordered for \$19 or downloaded as a free PDF from SARE's website; go to <http://goo.gl/vXa2Eb>.



Cowpeas

Cowpeas thrive in heat, grow fast and—with taproots reaching almost 8 feet deep—are highly drought-tolerant. They set about 130 to 200 pounds of nitrogen per acre and typically contribute a couple of tons of biomass to replenish soil organic matter. They do well in a wide range of soils, except highly alkaline soil.

Plant cowpeas in thoroughly warmed soil a week or two after your recommended date for planting sweet corn. Make successive plantings up to nine weeks before a killing frost. Treat the seeds with a rhizobial inoculant specific to cowpeas to ensure maximum nitrogen fixation. Tight plantings shade out weeds and conserve moisture, so plant seeds 1 inch deep in rows 6 inches apart (up to 15 inches apart for viny varieties) with seeds 2 inches apart in each row.

Beneficial insects feed on cowpeas' flowers and "extrafloral nectaries" (nectar-secreting glands near leaf nodes). The green plants make good fodder, which can also be dried for hay. Mature seeds provide feed for poultry and livestock and are a delicious table legume, too. Because a number of varieties set seeds at as early as two months, cowpeas are outstanding candidates to follow spring crops and set nitrogen for heavy-feeding, fall-planted alliums.



Sunn hemp undergoes an impressive growth spurt from two weeks after planting (top left) to four weeks (top right). The crop's yellow blooms boost insect diversity (left).

eration. It can fill midsummer niches between spring and fall crops, especially if the latter would benefit from a nitrogen boost. Sunn hemp is adapted to a wide range of soils (so long as they aren't waterlogged), but isn't frost-tolerant.

Plant sunn hemp a week or two after you'd plant sweet corn in your area, and succession sow up to nine weeks before a killing frost. Plant inoculated seed (use the same inoculant as for cowpeas) 1 inch deep, spacing 1.5 inches in the row and with rows 6 inches apart. Planting densely will crowd out weeds.

Younger sunn hemp plants contain more nitrogen, so cut them

for composting or for a nutrient-rich garden mulch that will break down rapidly. After 60 days, the stems thicken and become fibrous and higher in cellulose; cuttings at this stage will make long-lasting mulches that increase soil carbon.

Sunn hemp can be a valuable fodder, but *only* if you grow the variety known as 'Tropic Sun.' Other strains contain toxic alkaloids. 'Tropic Sun' is drought-tolerant and resistant to and suppressive of root-damaging nematodes.



Use a scythe to efficiently cut back cover crops in large plots. Make multiple cuttings to encourage regrowth.

Sunn Hemp

Sunn hemp is a tropical legume that quickly grows to 9 feet tall (see photo, Page 60). In dense plantings, it can set more than 120 pounds of nitrogen and 5,000 pounds of biomass per acre—or twice that if you cut the crop back, stimulating branching and additional root pen-

Harvey Ussery, a veteran of raising homegrown produce and poultry, homesteads and grows cover crops year-round in northern Virginia. Find more tips on Ussery's website at www.TheModernHomestead.us.

4 Garden Plans for KITCHEN HERBS

Supplement your food garden
with a patch of delightful herbs.



By Barbara Pleasant

The stunning flavors of culinary herbs make them star players in a healthy diet, and the best way to make the most of big-flavor herbs is to grow them yourself. This article includes plans for four herb gardens, each designed to fit into a 12-square-foot area, to help you make the best use of space near your kitchen door. All of the designs include 12 popular, delicious culinary favorites. See “Top 12 Kitchen Herbs” on Page 66 for more on the featured herbs: basil, chives, cilantro, dill, marjoram,

mint, oregano, parsley, rosemary, sage, tarragon and thyme.

If you like, you can grow kitchen herbs in a geometrical design dating from the days of medieval monasteries, but there are easier ways to include culinary herbs in your landscape design. By following a few basic guidelines and choosing to grow the herbs you’re most likely to use, you can grow a generous supply of kitchen herbs in a surprisingly small space. Add some container herbs that are marginally hardy or prone to crowding out other plants, and you’re well on your way to a gourmet herb garden.

The first and most important attribute of your herb garden is accessibility. Grow your herbs as close as possible to your kitchen door. “Accessing your cooking herbs should be as easy as going to your pantry,” says V.J. Billings, who grows herb plants by the thousands at Mountain Valley Growers in Squaw Valley, Calif.

To find great places to grow herbs, simply walk out the door closest to your kitchen and survey every space within 20 paces that gets at least a half-day of full sun. As you plan, consider the times you will dash out to grab a handful of chives, dill or basil when





Plan 1: Herbal Edging

9-by-1½-foot sidewalk edging; Scale: 0.75 inches = 1 foot

Stock the edge of a sidewalk with kitchen herbs to take advantage of the walkway's solid, level ground. As long as only one side of the pathway is densely planted, it won't feel cramped, and the plants won't interfere with foot traffic. Herbs are color-coded by preferred growing method. See "Top 12 Kitchen Herbs" below for more on each herb, including a color key for planting information.

it's raining or something on the stove needs your attention. Having your herbs within easy reach of a walkway or some well-placed stepping stones can also make a big difference when it comes to accessibility.

Herbs need average or above-average soil with good drainage, but they are generally not as demanding as vegeta-

bles and flowers. With kitchen herbs, it's better to make use of a convenient location than to move away from the house in search of better soil.

Choosing Herbs

By now you probably have visions of your favorite herbs dancing in your head. While flavor will certainly be a

top consideration when choosing your herbs, aesthetics are also important. Gayle Sathre-Zimmerman, owner of So Succulent Gardens in Columbia Station, Ohio, suggests including a variegated plant, or one with dark leaves, to enhance the visual appeal of your herb garden. Thyme, sage and mint come in variegated versions, and basil varieties

Top 12 Kitchen Herbs

The preferred methods to start these 12 herbs are indicated by the colors of their corresponding titles below and in the plans:

Green = sow herb seeds or use transplants

Blue = sow seeds only

Orange = use transplants only

Basil

Seeds or seedlings of basil, a warm-season annual, can be planted at the same time as tomatoes. Pinch back flowering spikes to encourage new leaf production, and make a second planting from direct-sown seeds in early summer. The flavor of basil is best when used fresh.

Selections: 'Genovese' is the gold standard for cooking. Other varieties feature burgundy leaves, compact growth habits or foliage with frilled edges. Look also for Thai or cinnamon basil varieties.

Chives

A mild-flavored perennial allium hardy to Zone 3, chives produce lovely edible flowers in spring. Chives can be grown from seed, but it's faster to start with plants. Keep leaves trimmed to prolong production, and divide and replant clumps in early fall. This plant can self-seed too vigorously in cold climates. Preserve chives by freezing them.

Selections: Compact 'Grolau' (windowsill chives) is great for containers. 'Grande' features big, broad leaves.

Cilantro

A fast-growing annual, cilantro can be planted twice a year, in spring and again in late summer. Cilantro is among the easiest herbs to start from seeds sown directly in the garden, but it suffers badly when transplanted. Plants are hardy to Zone 7.

Leaves lose their flavor as the plants grow tall and develop flowers. Leaves are best used fresh; try freezing cilantro for winter use. The ripe seeds are the spice known as coriander.

Selections: 'Santo' bolts later in the season than other varieties and 'Delfino' has lacy, fern-like leaves.

Dill

This cool-season annual bears flavorful leaves when young, then quickly produces flowers and seeds. Plant seeds in spring and again in late summer, or allow the spring sowing to shed ripe seeds. Tall varieties grow to 4 feet, though there are also dwarf types. Leaves are best used fresh; seeds dry well.

Selections: Dwarf 'Fernleaf' is great for containers and 'Vierling' bears early yields of beautiful yellow bloom clusters for flower bouquets.

Marjoram

A tender perennial usually grown as an annual, marjoram has a low, mounding growth habit. New plants are easy to grow from seed or rooted stem-tip cuttings. The flavor of the leaves resembles mild oregano and remains flavorful when dried.

Selections: Italian oregano is a marjoram-oregano cross with excellent flavor.

Mint

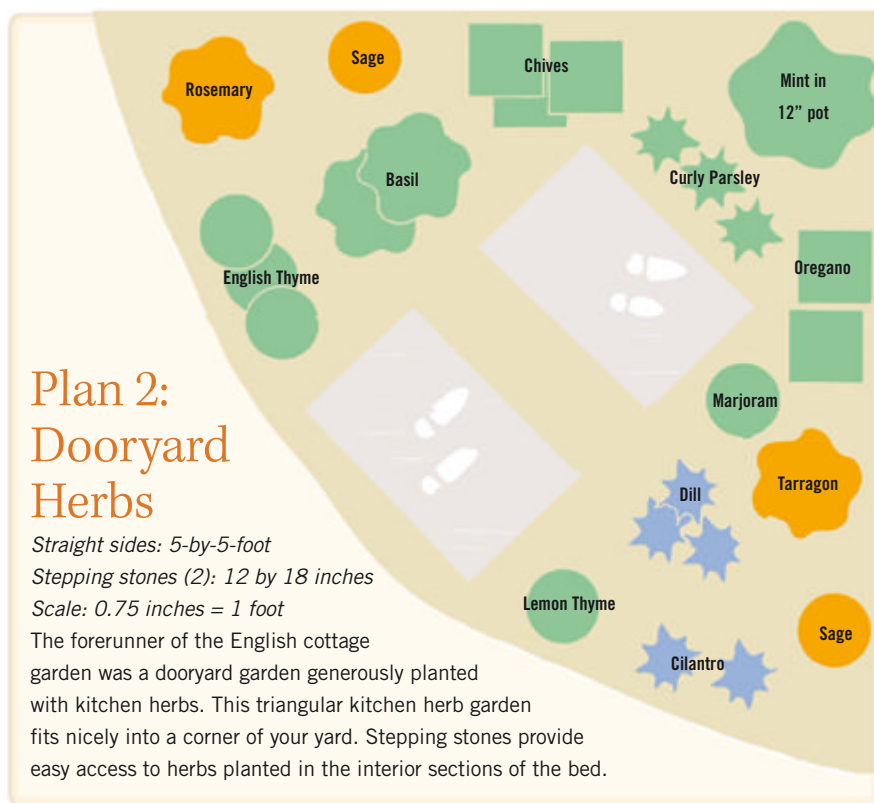
Mint strains and species vary in flavor, but all are hardy perennials to Zone 5, and sometimes as far north as Zone 4. Mint can be started from seed, but vegetatively propagated strains often have superior flavors. Most mint plants grow to less than 18 inches tall; all are aggressive spreaders that are best grown in containers. Clip back growing tips every month to

with purple leaves are as flavorful as those with green leaves.

Also be on the lookout for varieties with unusual textures and forms. 'Berggarten' sage has broad, velvety gray-green leaves that give it a luminous presence in an herb garden. Pineapple mint is another lovely variety which is known for its variegated leaves.

Several of the top culinary herbs, such as dill, basil and cilantro, are fast-growing annuals whose seeds can be sown directly in the garden. Most other cooking herbs are hardy perennials that come back every year. Perennial herbs can be grown from seed, too, but the seedlings require several months to reach picking size.

Some herbs require starting with plants that were propagated from rooted stem cuttings. For example, mints that carry the subtle flavor of chocolate or pear are best purchased as plants, and



Plan 2: Dooryard Herbs

Straight sides: 5-by-5-foot

Stepping stones (2): 12 by 18 inches

Scale: 0.75 inches = 1 foot

The forerunner of the English cottage garden was a dooryard garden generously planted with kitchen herbs. This triangular kitchen herb garden fits nicely into a corner of your yard. Stepping stones provide easy access to herbs planted in the interior sections of the bed.

encourage new growth. Easy to dry.

Selections: Use peppermints (*Mentha x piperita*) and spearmints (*Mentha spicata*) for cooking. Pineapple mint (*M. suaveolens*, or 'Variegata') has beautiful variegated leaves.

Oregano

Oreganos vary in size, flavor and growth habit; all are easy to grow from seeds or rooted cuttings. Cold-hardy to Zone 5, dormant oregano can be potted up and overwintered in an unheated garage even in colder climates. Dried leaves hold their flavor well.

Selections: Greek oregano (*Origanum vulgare* spp. *hirtum*) has the best flavor.

Parsley

A biennial hardy to Zones 5 or 6, parsley is often grown as a compact annual. Grow any parsley from direct-sown seed, though seeds are slow sprouters. Young plants can be set

out as seedlings if roots are handled gently. Flavor is best when used fresh.

Selections: Curly parsley is a lovely edging plant, but most cooks prefer to use the flat-leaved version, often called Italian parsley.

Rosemary

A woody perennial often hardy to Zone 7, rosemary can be pruned back, potted up and kept indoors through winter in cold climates. Superior rosemary varieties are best purchased as plants. Varieties differ in size and flavor, though all produce pungent leaves and sturdy stems that can be used as skewers. Easy to dry.

Selections: 'Arp' and 'Madeline Hill' tolerate colder climates. Try compact 'Blue Boy' in containers.

Sage

This 20-inch-tall, woody perennial is hardy to Zone 5, but

new plants should be started from rooted stem-tip cuttings every other year. The species features gray-green leaves; variegated varieties are less cold tolerant and more petite. Easy to dry.

Selections: Compact 'Berggarten' is great for tight spaces. 'White Dalmatian' features silvery leaves, and 'Tricolor' foliage has pink and white stripes.

Tarragon

Hardy to Zone 3, French tarragon grows to 24 inches tall with stems that tend to sprawl. If a stem rests on the soil, covering it with soil often coaxes it into developing roots. In midsummer, cut back your plants by half to stimulate new growth. This is a fine herb for flavoring

vinegars, especially balsamic vinegar, and it's easy to dry.

Selections: There is but one true French tarragon, which must be purchased as a plant. Nibble a leaf before you buy; it should have a zingy—not piney—licorice flavor.

Thyme

The best species for cooking grows to 12 inches tall and is hardy to Zone 4. It can be grown from seed, seedlings or rooted stem-tip cuttings. Cut back blooming branches to increase production of leaves. Easy to dry.

Selections: Upright, green-leaved French or English thyme (*Thymus vulgaris*) provide the best flavor. Variegated forms, including golden lemon thyme, are excellent for growing in containers.

For help finding these seed varieties, visit our Seed and Plant Finder at www.MotherEarthNews.com/Custom-Seed-Search.

the only tarragon worth having is French tarragon, which is always grown from rooted cuttings. To be sure you're getting true French tarragon, taste a leaf before you buy. The flavor includes hints of anise, licorice and mint.

If you buy fresh mint, oregano or marjoram at the store, and you decide you'd like to grow it, choose a few healthy sprigs and try growing them as rooted cuttings. Pinch off all but the top three or four leaves, trim the base of the cutting back to green healthy tissue, plant the cutting in a pot of moist soil, and cover with a plastic bag for a few days. I have rooted oregano right in the garden by covering the cutting with a flowerpot for a week (the pot protects the little plant from sun until it has time to grow roots). My mint got its start as a supermarket sprig, and after four years it's still going strong.

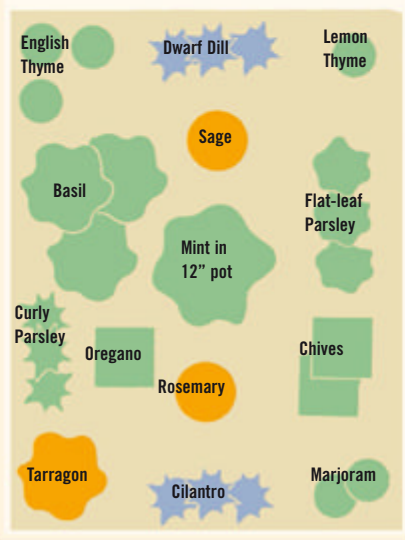
Rosemary is not consistently winter hardy beyond Zone 7. Also, cold winter winds can damage oregano, sage and tarragon, even in areas where they're rated hardy. The safest way to make sure your favorite perennial herbs survive winter is to move them to pots, allow them to become dormant, then keep in a cold garage or outbuilding where temperatures seldom drop below 20 degrees Fahrenheit.

Plan 3: Raised Bed

4-by-3-foot raised bed

Scale: 0.75 inches = 1 foot

Transform a patch of lawn into a compact, colorful garden by installing a simple raised bed and stocking it with herbs. By keeping the tallest herbs in the center, the edges can support a diverse collection of smaller plants.

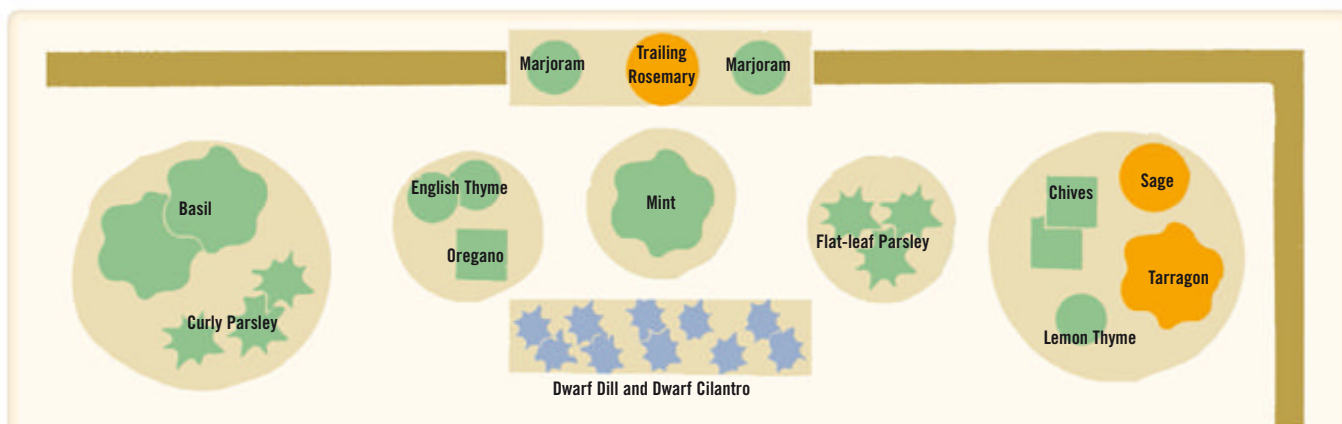


A second winter-weather option is to dig and store only rosemary, and surround your other perennial herbs with a 12-inch-tall wire cage filled with loose straw or pine needles. A loose pile of evergreen boughs arranged over the plants' crowns also does a great job of

protecting them from biting winter winds. Remove either form of winter protection about a month before the last expected frost.

You may want to mail order special strains of some culinary herbs, or wait until spring and shop for plants at local garden centers or herb farms. As you examine prospective adoptees, take a moment to check the pot to see how many plants are growing there. Last spring, when I bought what was offered as a single sage plant, I found four nicely rooted cuttings in the pot, which were easy to pull apart and put out in individual planting holes. Small pots of basil often contain more than a half dozen little seedlings, which can be divided and transplanted, provided you shade them from the sun for a few days as they become accustomed to the conditions in their new home.

If all of this talk of seeds, winterizing and cuttings has you feeling confused, take a deep breath and relax. Your first venture into a kitchen herb garden is sure to be successful if you start with a simple planting plan such as the ones shown here. Fill your garden with tried-and-true favorites offered as collections by Mountain Valley Growers and many others. Start small, keep it simple, and you're sure to be delighted by the fantastic flavors of your homegrown herbs.



Plan 4: Container Combo

8-by-3-foot deck or patio area; Scale: 0.75 inches = 1 foot

- (2) 8-by-24-inch oblong planters
- (2) 18-inch round planters
- (3) 12-inch round pots

A sunny deck or patio makes a great place to grow kitchen herbs. Combine them in large containers, which require less frequent watering than small ones. Round containers add visual interest if used in close company with oblong planters.

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'Dostal Cucumber' Squash

Donated to SSE by Arthur Dostal and described as a Nebraska heirloom. This variety was grown by Arthur's parents, Lewis and Mary Dostal of Tama County, Iowa. Traditionally grown as a winter squash, but tastes good as a summer squash, too.



'Holmes' Royal Red' Radish

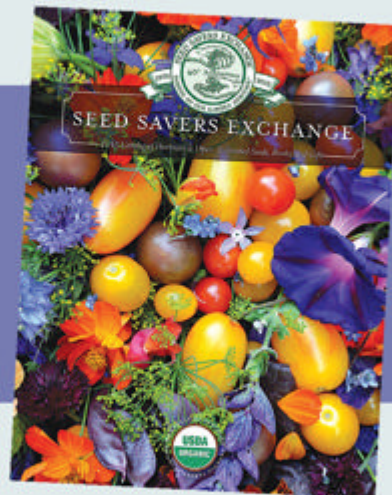
Introduced in 1899 by the Holmes Seed Company of Canton, Ohio. In that year, Holmes praised the radish by saying: "The beautiful color and shape of this Radish makes it a very attractive table relish, and its flavor deliciously bears out its tempting appearance."



'Smooth German' Kale

This annual kale was donated by Irene Kemper of Nebraska. Her great grandparents brought seeds of this variety with them when they emigrated from Germany. The kale was a treasured heirloom in the family.

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SUMMER'S RICHES

*Green Beans,
Tomatoes and Basil*



These jewels of the peak-season garden pair nicely for simple yet unforgettable meals.

Story and photos
by Barbara Damrosch

For the summer gardener-cook, every day brings an armload of beautiful vegetables, and the happy challenge is to make the most of them, especially those that thrive only in the warm season. Of these, tomatoes win the prize, and I could cheerfully put a platter of sliced, just-picked, ripe tomatoes on the table at every meal, but we must also make

room for tomato soups, pasta with fresh tomato sauces, and BLTs. High summer is a busy time. Even a basic ripe-tomato sandwich with mayo and a few basil leaves tucked in makes a satisfying summer meal, so the simplest summer recipes often work best.

Tomatoes may be the nation's most popular garden vegetable, but in some regions, they're a little tricky to grow (for an essential playbook, see "All About Growing Tomatoes" online at <http://goo.gl/LXNgc9> and check out

our collection of expert tomato-growing advice at <http://goo.gl/qACxzZ>). Beginners often plant more than they need—remember, a single cherry tomato plant will keep a couple well supplied for snacking and for scattering over salads. But you'll want a few of the indeterminate (vining) type with larger fruits for summer-long harvests. If you'd also like to dry, freeze or can tomatoes, grow a half-dozen determinate (bush-type) tomatoes as well. These ripen over a shorter stretch of time, which is just right for a few weeks of processing. Of these, dense, meaty, plum-shaped paste tomatoes make the quickest sauce with the deepest flavor.



Kitchen Tips for Top Tomato Treats

Ideally, you'll harvest tomatoes when they have fully colored up and softened. Sometimes picking them before that perfect day is necessary, to avoid some anticipated ill fate—an intractable pest, a disease, or the cracking that can happen with certain heirloom varieties. In fall, a frost might take you by surprise before you've had a chance to can or freeze your bounty. Fortunately, tomatoes ripen off the vine. If that hard green ball has even the slightest pink blush, it will eventually turn red on your kitchen counter.

After they're picked, ripe or not, tomatoes should not be refrigerated. Cold is the enemy of their flavor—another reason not to let tomatoes hang on the vine very far into fall, even if frost holds off.



Plant wisely, and you'll have all the tomatoes you could desire for cooking, canning, freezing, dehydrating and eating fresh.

In many cases, such as in sandwiches and salads, tomatoes can be used just as is. Other times, as in sauces, peeling is called for because the skin doesn't soften and shriveled bits of it can interfere with

a dish's texture. The best way to peel a tomato is to pour boiling water over it, count to 10, and then slip off the skin with your fingers. You can skin tomatoes that have been frozen whole by just holding them under running water for a few seconds.

Removing the pulp and seeds is sometimes necessary, too, either for texture or to decrease the water content. This can be done by cutting each fruit into quarters and scooping the pulp out of its cavities with your finger. For making a smooth sauce or purée, remove the skin and seeds by straining them out so you retain more of the nutrients in the pulp. If using a small food mill, cooking the tomatoes first makes the job easier. A more heavy-duty strainer can handle them raw.

Panzanella

Tomatoes may be a New World fruit, but this summer salad was born in Italy. It's just the thing to make when ripe garden tomatoes are piling up on the countertops—and ripe they must be, so the juices will sink into the chunks of bread. Slightly stale bread is often recommended, but use fresh bread if you have it, and crisp it a bit, if you desire, in a hot oven. Most importantly, use great ripe tomatoes, organic and homegrown (or at least grown locally), and the best bread you can find—crusty, rustic and absorbent. This is a sensual dish, best made more so with your fingers than with tools. *Yield: 4 to 6 servings.*

8 cups bread with the crusts left on, cubed or torn apart
1 clove of garlic, grated or pressed
1/3 cup extra-virgin olive oil
Dash of salt
Freshly ground black pepper
3 to 4 ripe tomatoes, or enough to make about 4 cups, coarsely chopped
2 ripe bell peppers (preferably orange or yellow), seeds removed, coarsely chopped
3 scallions, both green and white parts, chopped
1/2 cup fresh basil leaves, left whole if small, torn into pieces if large

Place the bread in a large salad bowl. Add the garlic to the olive oil, and sprinkle over the bread, along with

the salt and pepper. Toss thoroughly to mix. Peel the tomatoes by pouring boiling water over them, so the skins slip right off. Chop coarsely, or pull them apart with your fingers, and then add them to the bowl of bread and toss again. Let the mixture sit for about 5 minutes, but do not refrigerate. Taste, and add more salt and pepper if needed. Add the peppers and scallions, then mix again. Stir in the fresh basil just before serving at room temperature.



The juices from fresh, ripe tomatoes give new life to stale bread in this dish.



Highly productive pole beans need tips or trellises to give them plenty of room to climb.

Bountiful Beans

Meanwhile, as my mother would say, you're "keeping up with the beans." As with tomatoes, beans come in both vining and bush types. Vining ones, usually called "pole beans" because they need support, bear for a long season, but must be picked regularly or they'll stop making pods. So pick you must, even if it means giving some away. Bush beans

mature over a shorter period, ideal for freezing, shelling or gorging.

With any bean, a series of harvests is possible. Start by picking some when the pods are small and skinny, as the French do, letting others get full-sized for the more typical snap bean harvest. If you wait too long and you can feel the seeds in the pod, wait a few days more until the shell bean stage, when the shells will

toughen but the seeds will swell to full-sized yet are still soft enough that you can dent them easily with your fingernail. This is a great way to take advantage of a surplus if you've fallen behind in your picking.

Lima beans are the most familiar shell bean type, but virtually any edible bean can be enjoyed this way. After shelling, the fresh bean seeds cook in about 20 minutes. To get dry beans for storing, just let the pods get fully dry, crisp and brown on the vine. Just note that, picked too soon, dry beans will get moldy when stored. Left too late, rain, frost or disease may ruin them.

Cooking with Basil

And basil! What would high summer be without basil's lush, pungent leaves? The thing to remember about growing basil is to pinch off the flowering tips. This makes the plant branch and become bushy, giving you a better yield, and also keeps flowers from forming, which would eventually end the plant's leaf-producing stage. If flowers do form, pinch them off quickly.

Herby Pickled Beans

Homemade dilly beans are easy to make. And if your dill has bolted before the beans are ready to pick, you can use any favorite herbs to season them. Fennel fronds or tarragon, for instance, would be nice. And don't worry if your beans aren't perfectly long and straight so that they stand up evenly in the jar. The curly types look and taste just fine even though you might not fit quite so many in. Just make sure they're plump and fresh, without blemishes. This recipe makes pickled beans for short-term storage. They'll keep for a month or two in the refrigerator. Fish them out of the jar as a snack, or use them in a salad or as a condiment with meals. *Yield: 2 pint jars.*

2 whole cloves of garlic, peeled

2 tsp dried, crumbled hot pepper

About a half-pound garden beans, washed and trimmed at both ends

1 cup distilled white or cider vinegar (at least 5 percent acid)

2 tbsp sea salt or pickling salt

Several sprigs of fennel fronds, tarragon or dill, cut from the tips

Divide the garlic and hot pepper between two clean, wide-mouth pint canning jars. Lay the jars on their sides and stuff as many beans as you can inside of them. In a pitcher, combine the

vinegar and salt with 1 cup of water, stir, and pour the mixture into the upright jars, covering the beans but leaving a quarter-inch headspace at the top. Carefully poke the herbs in, stem end down. Screw on clean canning jar lids and keep refrigerated.



Vary the herbs in this recipe to make pickled beans to your liking.

Basil does not hold its flavor well when dried, but it can be frozen. Purée or chop it finely and preserve it in oil. This is a bit like making pesto. Basil discolors easily, especially when moist, so don't wash it just before puréeing or chopping it to freeze.

I mix chopped basil with olive oil and freeze it in straight-sided jars — only the surface turns a little dark. It stays

soft enough that I can remove chunks of it as needed with a small knife. You can also freeze basil in oil by using ice cube trays with individual compartments. Be sure to leave the cubes in the tray until ready to use or they will darken on all sides.

If, despite your best efforts, your basil goes to seed too early in the season, just sow some more. 🌱

Barbara Damrosch farms and creates delicious recipes with her husband, Eliot Coleman, at their Four Season Farm in Harborside, Maine. She is the author of *The Garden Primer* and, with Coleman, of *The Four Season Farm Gardener's Cookbook*. See www.MotherEarthNews.com/Shopping to purchase.

Soupe au Pistou

When basil plants are bushy and lush, it's time to make this specialty of France. *Pistou* (like the Italian pesto) refers to the pestle with which basil is traditionally ground to make the necessary basil-based sauce. This is a quick soup, full of fresh flavors. Omit the shell beans if you have none, as well as the bacon for a vegetarian version. For an extra-meaty soup, add big chunks of browned sausage. Some will want to increase the garlic, or add scallions, young leeks, or a few peeled, chopped, fresh tomatoes.

The *pistou* recipe here omits the nuts I would toss into the blender if I were making the sauce to serve atop spaghetti. I like to pass the *pistou* separately, and have each person add a dollop and stir it in, watching the soup turn a striking shade of green. *Yield: 4 to 6 servings.*

Pistou

1 cup fresh basil leaves, packed
1 clove of garlic, peeled and coarsely chopped
1/4 cup extra-virgin olive oil
1/4 cup grated Parmesan cheese, packed

Soup

1 cup fresh shell beans, removed from their pods
2 ounces slab bacon cut into 1/4-inch cubes, or 2 strips sliced bacon, chopped (or 2 tbsp olive oil for vegetarian version)
2 medium onions, coarsely chopped
1 large rib of celery, coarsely chopped
1/2 pound small young potatoes, unpeeled, cut into chunks
Two 6- to 7-inch-long zucchinis (about 1/2 pound), cut into rounds
1/4 pound each green and yellow snap beans, trimmed and cut into 1-inch lengths
1 bay leaf
1/4 tsp salt, or to taste
Freshly ground black pepper

Pistou: Combine the basil leaves, garlic and olive oil in a blender or food processor. Blend just until smooth and well-mixed. Do not over-blend. Scrape into a bowl and add the grated Parmesan. Stir until well-mixed. Cover and refrigerate if not using right away. You can also make large amounts, use what you need, and freeze the rest in small, straight-sided jars or ice cube trays.

Soup: Put the shell beans in a small saucepan with water to cover and simmer until just tender. Drain and set aside.

While the beans cook, heat a Dutch oven or large saucepan over medium heat and fry the bacon until browned, then remove with a slotted spoon and set aside. Fry the onions in the remaining bacon grease (or olive oil) over medium heat, stirring, until translucent. Add the celery, potatoes, zucchini, snap beans, bay leaf, salt and pepper. Add 3 cups of water, or enough to cover, bring to a boil, then cook over medium-low heat for about 15 minutes until vegetables are tender.

Add the shell beans and bacon to the soup. Reheat for a minute or two, taste for salt and pepper, and then serve hot, passing the *pistou* in a bowl for diners to stir in.



You can add ripe, chopped tomatoes to this summer soup recipe for added color and flavor.

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Expert Tips for Growing EARLY TOMATOES

Want to fulfill your cravings *and* make your neighbors jealous?

Add a whole month to your fresh-tomato season with these proven techniques.

By Barbara Pleasant

In almost any climate, the best time to start seeds for most tomato varieties is six to eight weeks before your average last spring frost. (Don't know your frost dates? You can find them at <http://goo.gl/Wk8fDQ>.) Going by this tried-and-true schedule will provide juicy tomatoes by high summer—but many gardeners and cooks become impatient for sun-ripened tomatoes even earlier in the season.

You can satisfy this premature tomato craving by learning how to grow extra-early tomatoes. By choosing varieties that mature quickly, starting those seeds a month ahead of your typical schedule—10 to 12 weeks before your last spring frost—and then giving the plants

special care, you'll harvest tomatoes at the beginning of summer, when your main-crop tomatoes are only just beginning to bloom.

Most tomato varieties thrive in warm soils, so plan to grow your earliest tomatoes in containers for best results. In spring, when the plants start spending time outdoors, their roots will stay warmer in containers than they would if planted in the ground. You won't need huge vessels because the stress from slightly cramped roots will push quick-maturing tomatoes to produce flowers and fruits in less time than usual. A 3-gallon bucket or a 12-inch-diameter pot or hanging basket will be about right for each plant. Ideally, each container should have a lip or handle for easy lifting.

Extra-Early Varieties

In the garden, indeterminate varieties that produce for many weeks are usually preferable, but certain compact, determinate varieties will provide you with more tomatoes sooner. Choose carefully—some early determinate varieties have much better flavor than others! The following open-pollinated, determinate tomato varieties have well-deserved reputations for delivering rich, main-season tomato flavor in record time.

'**Sophie's Choice**' is a cool-tolerant heirloom tomato developed in Edmonton, Alberta. This variety produces round, red slicers on compact, 24-inch plants. Fruit size varies from egg-sized to baseball proportions, and the flavor of 'Sophie's Choice' is mildly

sweet with a pleasing balance of tangy aromatics.

'Glacier,' a smaller, red slicer, comes from Sweden and has potato-leaf foliage and a bushy growth habit. The bulky 'Glacier' tomato plant grows to 30 inches tall, and needs staking to support its concentrated crop.

'Whippersnapper' is a pink-red cherry tomato with a quirky growth habit. Short side branches spread out horizontally, making the 'Whippersnapper' tomato ideal for containers or hanging baskets. In Canada, this variety has gained a following after winning a race for first ripe tomato of the season.

Do not pinch or prune these or other quick-maturing determinate tomato varieties, because all stem tips will bear flowers and fruits, and then the plants will decline. You can try growing exceptionally early indeterminate varieties, such as 'Stupice' (small slicer) or 'Bloody Butcher' (large cherry), but their sprawling growth habits make them difficult to handle in containers. Growing these types outdoors in plastic-wrapped cages is a better bet.

The Right Light

Tomatoes are full-sun plants, so indoor starts need supplemental light to grow well. Fluorescent lights are cheap and easy to rig up, but they're not all alike. To learn about the newest generation of energy-efficient grow lights, see "Best Grow Lights for Starting Seeds Indoors" at <http://goo.gl/GzkZ9E>.

Keep your lights on for about 14 to 18 hours per day. You can use a timer, or operate the light manually. Pause to blow on the plants twice a day—these little puffs of wind will enhance the sturdiness of the growing stems.

Planting, Care and Feeding

Use a fresh bag of seed-starting mix to get your seeds going in small con-



Tomato seedlings need plenty of light to grow well.



Next season, see fruiting action weeks ahead of schedule!



'Sophie's Choice' (above) and 'Whippersnapper' (opposite) are great-tasting, quick-maturing tomato varieties.

tainers, such as plant cell packs or 4-ounce paper cups. After your young plants each produce one true leaf and you can see white roots in the drainage holes, gently repot the plants into 4-inch containers.

After three weeks or so, when the plants' roots have filled the 4-inch pots, shift the plants into their permanent containers—12-inch-diameter pots or baskets, 3-gallon black nursery liners, or plastic buckets that have plenty of drainage holes.

You can start with any good commercial potting soil for growing early tomato varieties, and then mix in up to one-third part compost. Watch plants to make sure they're growing steadily, and feed them with a diluted, liquid organic fertilizer if new growth stalls. Be ready to step up feeding when the weather gets warm enough to move the plants outdoors. Dry organic fertilizers are easy to sprinkle over the soil's surface before thorough waterings. With container tomatoes, you'll need to be extra-diligent about watering; strive to keep the soil lightly moist at all times.

In Transition

On sunny spring days with temperatures above 55 degrees Fahrenheit, move the plants to a spot outdoors that gets sun, but little or no wind. The container tomatoes will probably be too large for a cold frame, but you can make a high-profile mini-greenhouse in minutes by turning a small table upside down and attaching sheet plastic to the legs to form an enclosure. If needed, you can shroud the set-up with row cover for additional insulation. Bring the plants inside at night and during periods of cold, damp weather, keeping them in your brightest window.

As soon as your early tomatoes produce flowers, enhance pollination by blowing gently on

the flower clusters or touching the back of a vibrating toothbrush to blossom-bearing stems. You'll want to mimic the buzzing action of pollinating bees, which, according to the Xerces Society, can increase fruit set by approximately 45 percent.

If you choose quick-maturing tomato varieties and start growing them in containers 10 to 12 weeks before your last spring frost, then you'll enjoy delicious homegrown harvests weeks before your neighbors even pick their first fruits. 🍅

TOMATO VARIETIES That Can Take the Heat

Some tomato plants boast far superior fruit set when the goin' gets hot. Try these heat-tolerant varieties to get a good crop even in toasty spells and warm climates.

By Lynn Byczynski

Faced with long bouts of daytime temperatures higher than 85 degrees Fahrenheit and nights above 72 degrees, tomatoes may fail to set fruit. The plants may look dark green and vigorous—evidence that all other growing conditions are favorable—but have blossoms that dry up and fall off.

If the heat spell lasts no more than a week, the tomato plants will quickly recover. During long stretches of warm nighttime temperatures, however, the plants will stop setting, causing a subsequent gap in tomato production.

In recent years, a flood of new varieties has been bred for greater heat tolerance. Known as “heat-set” or “hot-set” tomatoes, some commonly grown hybrids are ‘BHN 216,’ ‘Florasette,’ ‘Florida 91,’ ‘Heatwave II,’ ‘Solar Fire,’ ‘Summer Set,’ ‘Sunchaser,’ ‘Sun Leaper,’ ‘Sunmaster,’ ‘Sun Pride’ and ‘Talladega.’ According to the Alabama Cooperative Extension System, many heat-set varieties also perform well in cool, rainy weather.

Some heirloom tomato varieties are heat-tolerant as well, and these include ‘Arkansas Traveler,’ ‘Eva Purple Ball,’ ‘Hazelfield Farm,’ ‘Homestead 24,’ ‘Illinois Beauty,’ ‘Neptune,’ ‘Ozark Pink’ and ‘Tropic.’ Additionally, some “cold-set” varieties, such as ‘Stupice’ (pictured here), are all-weather standouts because they’re able to produce in hot weather, too. A handful of cherry tomato varieties,

such as ‘Lollipop’ and ‘Yellow Pear,’ also do well in prolonged stints of heat.

Tomato growers in the South commonly choose heat-tolerant tomato varieties for summer and fall production—a strategy growers farther north may want to emulate now that climate change is causing hotter summers in most regions. When growing tomatoes in hot temperatures, you can boost your success rate by planting deeper (where the soil temperature will be lower), providing afternoon shade, watering in the morning, and using thick organic mulch to keep soil cool.

Learn more about heat-tolerant tomato varieties in the Alabama extension publication “Blossom Drop in Tomatoes” (go to <http://goo.gl/HXf8En>) and in the Louisiana extension publica-

tion “Performance of Hot-Set Tomato Varieties in Louisiana” (check it out at <http://goo.gl/yuxdT5>). To find seed sources for many of the varieties mentioned here, use the Seed and Plant Finder at www.MotherEarthNews.com/Custom-Seed-Search. 🌱



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GROW GREAT LETTUCE

This reliable crop is a top choice for any food garden.



Liven up your salad greens with fresh, edible flowers, such as nasturtiums.

By Roger Doiron

If you could grow only one vegetable for your own consumption, which crop would you choose? For me, the choice would be easy: lettuce.

You could make a good case for growing other crops instead: a highly caloric crop (potatoes), a more flavorful one (tomatoes) or a better keeper (carrots). But I would pick lettuce because it's easy, reliable, requires little space and enjoys a long growing season, allowing for multiple and continuous harvests. Lettuce also offers a nice mix of nutrients in a compact package, including iron, folate, and vitamins A and C. It's for these reasons that I recommend to new gardeners that lettuce be the first step in their journey to delicious, homegrown self-reliance.

Lettuce Types

While “iceberg” is the bland poster child for store-bought lettuce, it's part of a larger, diverse and better-looking family than people may realize. Gardeners can choose from hundreds of lettuce varieties, all falling into six groups (see “Six Lettuce Types: Which Will You Try?” below).

For beginners, I recommend starting with loose-leaf varieties, also known as “cut and come again” lettuces (meaning you can cut a harvest, then harvest again in a few weeks). These varieties are not only the easiest to grow, but they come in many seed mixes, offering a balance of colors, textures and flavors.

To add some extra color and zing to your salad bowl, I suggest planting a row of spicy mesclun mix for every row of lettuce you grow. Most seed companies offer mesclun mixes of arugulas, kales and mustard greens, which, with the addition



Branch out beyond produce-aisle lettuce! Try some crunchy romaines (top left, top right and lower left), red and green butterhead (middle right), and beautiful ‘Oak Leaf’ loose-leaf lettuce (bottom right). Salad night will never be the same.

of some cheese, chopped walnuts and a couple of edible flowers, can turn a ho-hum salad side dish into a memorable main course.

Preparing to Plant

As with any crop, delicious salad greens start with the soil. Lettuce does best in sandy loam soil with a high level of mois-

ture-retaining organic matter, but don't be discouraged if you don't have those conditions. Lettuce grows all around the world in all types of climates and soils, including your own.

There's no ideal climate for all lettuce types, but most grow best in cool weather. Salad greens can be planted as soon as you can work the soil, which, here in Maine, is

Six Lettuce Types: Which Will You Try?

Butterhead: A soft, buttery texture characterizes these varieties, which form loose heads.

Chinese: Chinese varieties generally have long, pointy, non-head-forming leaves and a bitter flavor better suited to stir-fry than salad.

Crisphead: Varieties in this type (which includes iceberg) form tight, dense heads resembling cabbage. They are generally the mildest of the lettuces and are appreciated more for their crunchy texture than their flavor or nutritional value.

Loose-leaf: These varieties grow as leaves instead of tightly formed heads, and they have a delicate texture and a mild flavor. The most healthful choices are red loose-leaf varieties, followed by green loose-leaf varieties with a brown or reddish fringe.

Romaine, aka “Cos”: This heat-tolerant type grows a long head of sturdy leaves with a firm rib down the center.

Summer Crisp, aka “Batavian”: Think of this group as an intermediate between crisphead and loose-leaf types.



Cut loose-leaf lettuce 1 inch above the soil, then come back for more in a few weeks.

early to midspring. Most lettuce varieties germinate well in the range of 40 to 60 degrees Fahrenheit, making them an excellent spring and fall crop for gardeners in temperate areas.

Starting lettuce seeds indoors in pots is possible, but I don't bother. Space under my winter grow lights is limited, and I prefer to save it for longer-season crops such as tomatoes, which can really take advantage of a few weeks' head start.

How to Plant Lettuce

When planting, begin by working some finished compost (if you have some avail-

able) into the soil. Lettuce plants don't have time to root deeply and will benefit from the extra organic matter close to the surface. Next, rake your bed smooth so you have an even planting surface.

I plant my loose-leaf in rows, alternating lettuce with rows of mesclun and other crops, such as radishes in the spring and beets in the fall. Among lettuce's many positive traits is that it's a good neighbor and can be planted next to or between just about anything, provided it has enough water, space and light.

Rather than planting long rows, I plant one or two short rows across my 30-inch beds every two weeks. More than any other crop, lettuce works best with succession planting, because it turns bitter as it matures, especially in warm weather. With succession planting, there's always

a salad ready for the taking. Space your loose-leaf rows 6 to 12 inches apart, depending on the available space and soil fertility in your garden.

If you're growing a loose-leaf type or a loose-leaf mix, plant your seeds about 1 inch or so apart in a single line, cover them with about a quarter inch of soil, and gently pat them down to keep them in place. Water well, and within a week you should see them sprout.

What works for planting loose-leaf varieties also works for heading varieties. The only difference is spacing. Full-head lettuces can be planted either in rows or in a grid pattern 12 to 18 inches apart. If you're located in a hot climate or want to grow lettuce through the dog days of summer, consider interplanting your rows or heads with taller crops that can shade them.



Grow a mix of lettuces and other salad greens for maximum flavor and color in your bowl.

Great Lettuce Varieties

Variety	Description	Days to Maturity	Availability
'Encore' Lettuce Mix	A custom, all-organic mix of seven red and green loose-leaf varieties.	28 days	Johnny's Selected Seeds www.JohnnySeeds.com
'Green Salad Bowl'	A lime green, loose-leaf variety and All-American Selections winner. Easy to grow and heat-tolerant.	45 days	The Cook's Garden www.CooksGarden.com
'Mignonette Bronze'	An heirloom butterhead variety well-suited to hot and tropical climates.	60 days	Baker Creek Heirloom Seeds www.RareSeeds.com
'Winter Wonderland'	A tall romaine. Slow to mature, and laughs at cold weather. Can be overwintered in many cool climates.	70 days	Fedco Seeds www.FedcoSeeds.com

Harvesting Lettuce

One of the keys to having tender lettuce is rapid growth, which is why spring-grown lettuce tastes so good. When all of the right conditions are present—sunny, mild days, cool nights, sufficient water and good soil fertility—lettuce can go from seed to salad bowl in about 30 days. Most full-head varieties take 45 to 60 days to reach maturity.

Also consider timing when you're harvesting lettuce. Leaves are at their sweetest and most vibrant in the morning. A study by the U.S. Department of Agriculture from the early 1990s found that lettuce harvested at 7 a.m. contained nearly twice as much natural sugar as the same variety harvested at 2 p.m. While this is true for headers and loose-leaves, recent research indicates that harvesting baby greens in the evening is best if they are to be stored for more than a day.

Regardless of when you harvest, the tender leaves of lettuce demand careful handling. Harvested greens left in the late spring sun can start to wilt in just 15 minutes, so quickly get them out of the garden and into a cool, moist (but not wet) spot. If I don't have time to thoroughly wash my greens directly after harvesting, I give them a quick rinse in cold water before putting them in my refrigerator's crisper.

An exciting thing about harvesting lettuce is that it can be a repeat performance. Loose-leaves can be harvested twice—and sometimes three times—before the quality of the leaves declines. Make your first cutting about an inch above the soil. Keep your plants weeded and watered, and you should be able to harvest them again two to three weeks later.

Growing Tips

While lettuce is not a complicated crop, a few things can go wrong—most of them related to heat and moisture. If you live in a wet climate, you may discover the local slugs are eating more salad than you are. One of the best ways to get slugs to stop munching on your lettuce is to make them a more appealing offer: beer! Bury an empty tuna or



Do you have an abundance of greens ready? Harvest your head lettuce before it bolts, and it will keep nicely in the fridge for several weeks.

cat food can in the soil amidst the plants and fill it halfway with beer. Attracted by the smell, slugs will crawl into the container, but can't crawl out.

The greatest menace to lettuce is not slugs, but the heat. When temperatures exceed 70 degrees, lettuce seeds don't germinate well, and mature plants tend to bolt (they stop producing leaves and go to seed). Regular watering, using shade cloths or tall, shade-making companion plants, and planting heat-tolerant varieties can help, but extreme heat over time ultimately takes a toll on lettuce's flavor and texture.

The positive flip side to lettuce's heat sensitivity is that you can enjoy it during the cooler months when not much

else grows. In fact, many gardeners and farmers in northern areas use cold frames, low tunnels or minimally heated greenhouses to produce salad greens through winter.

Whatever your climate, I hope you'll grow some of your own lettuce this year. With organic mixes costing about \$4 for 5 oz., I can't think of a better way to hold on to your green than by growing some greens of your own. 🌱

Roger Doiron is the founder of Kitchen Gardeners International (www.KGI.org) and plants his sensational salads in Scarborough, Maine.

Human Salad Spinner

So, you've grown your own fresh, crisp lettuce, and now it's time to wash and serve it. A salad spinner works well to quickly remove water after the lettuce has been washed, but if you don't own a spinner, here's a trick that will work just as well: Wrap up the lettuce in a large, clean dish towel and step outside. Swing the bundle of lettuce in circles as fast as you can—like you're winding up to pitch a softball. *Voilà!* Most of the moisture will be gone when you open the cloth. Salad dressings will coat the leaves more evenly if the leaves don't have much water on them.



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Grow Superb STRAWBERRIES

Growing your own is
the best way to get
first-rate flavor.

By Kris Wetherbee

There's no denying the lure of sun-ripened strawberries oozing with sweetness and flavor. Just catching a glimpse of a rich, red berry is enough to arouse many an appetite, and if appearances alone guaranteed good eating, strawberries would

certainly win an epicurean gold medal every time.

Unless you live near someone who grows strawberries for market, growing your own is the only way to get that splendid strawberry flavor so lacking in supermarket crops. Truly ripe, tender, juicy strawberries are too perishable for transport. Commercially grown strawberries are bred for firmness, size and long shelf life—flavor is an afterthought. In addition, they are often harvested before the berries even turn red, a practice that halts the development of their flavor but not their luscious color.

Growing your own strawberries is also one of the easiest and most rewarding gardening efforts you can undertake. These modest plants need only a small amount of space in which to grow, and they produce large yields quickly. As you make plans to grow your own, here are some considerations that will help you succeed.

Types of Strawberries

Perennial garden strawberries come in three main types, defined by when they bear their fruit, according to Barbara L. Bowling, author of *The Berry Grower's Companion* and formerly a professor of

horticulture at Rutgers and Pennsylvania State universities. They are June-bearers (also called short-days), day-neutrals and ever-bearers.

June-bearers, available as early, mid- and late-season varieties, are the most widely grown by home gardeners. As their name implies, they produce their crop in June. **Day-neutrals**, which are gaining popularity, bear a modest crop along with the June-bearers and then continue to produce fruits into fall. “They initiate flower buds regardless of day length, thus producing some fruit throughout the summer and a sizable fall crop that is a great bonus for backyard growers,” Bowling says. Day-neutrals generally don’t thrive in areas that have hot summers, though. **Ever-bearers**, which are sometimes confused with day-neutrals, bear from early summer into fall but are less productive and have lower-quality berries. Nevertheless, their ongoing harvests have appealed to many gardeners over the years.

You can harvest berries from day-neutral and ever-bearing strawberries the first year; June-bearers shouldn’t be harvested until their second year. In many areas, if you grow a combination of these types, you’ll be able to harvest your own sun-ripened strawberries from late May to October every year.

Best Backyard Varieties

You should seek out varieties of these types that are especially adapted to your region. To learn the names of tried-and-true local favorites, check with your extension agency. A few varieties are widely recognized as among the best-tasting and most disease-resistant no matter where they’re grown. These include June-bearers ‘Earliglow’ and ‘Jewel’ and day-neutral ‘Tristar.’ Bowling’s book lists recommendations by region and

includes a chart that details the disease resistance of common varieties.

Among other popular recommended June-bearers, ‘Allstar’ has become the standard midseason variety in the East and Midwest. ‘Honeoye,’ also a midseason berry, has a “distinctive, perfumey” flavor, and ‘Red Chief,’ yet another midseason berry, offers excellent disease resistance. Among recommended day-neutrals, ‘Seascape’ is a large fruit with good flavor for gardeners in the

increase fruiting. Avoid areas where tomatoes, potatoes, eggplant, peppers or raspberries have been grown in the past five years, as these plants can act as hosts for verticillium wilt, which can attack strawberry plants, too.

Grubs also bother strawberries by eating their roots, so, if possible, avoid making a new strawberry bed anywhere sod was recently removed. If the perfect site is nowhere to be found, you can still avoid potential problems by planting in raised beds and choosing disease-resistant varieties.

Before planting, remove all perennial weeds and till in a 1- to 2-inch layer of compost. You can use grass clippings instead of compost as long as you wait a few weeks before you plant in order to give the clippings time to decompose. To be sure the shallow-rooted plants get off to a good start, this is one time when a fast-release fertilizer is appropriate.

In most of the United States, plant strawberry seedlings in spring as soon as the soil can be worked. In warmer regions, such as California and the South, you can plant strawberries as annuals in late summer or fall. Keep your planting holes wide enough to accommodate the roots, carefully fan out the roots as you plant, and be sure the top of the crown (the dense area between the roots

and stem) remains slightly above soil level while the roots are well-buried below.

Bowling recommends planting strawberries in a system called “matted rows.” “The strawberry’s perennial nature is used to best advantage in the matted rows by allowing the plants to be replenished with new growth each year,” she says. In this system, plants are spaced according to type (keep reading), and runners, which are long, horizontal stems that form small, “daughter” plants on the end, are allowed to fill in empty spaces, renewing the planting as they establish themselves.

June-bearers produce more runners than day-neutrals or ever-bearers do, and



Growing a mix of strawberry types ensures a long, happy harvest.

Northwest, and ‘Tribute’ produces large berries on vigorous plants.

Planting Tips

Strawberries may be highly perishable, but they will grow well in a range of locations. Plants produce the best fruit if grown in full sun and slightly acidic soil. They are nutrient-demanding plants, so take care to provide a nutrient-rich soil high in organic matter. Choose a site with excellent air circulation and drainage (raised beds are good as long as the soil doesn’t dry out). Planting strawberries in rows one-plant wide will help sunlight penetrate the entire plant and

they should be spaced 18 to 24 inches apart with about 3 to 4 feet between rows. This spacing allows the runners to root and eventually form a matted row. Space day-neutral and ever-bearing types 5 to 9 inches apart, with 24- to 30-inch aisles between each row. These two types require a more constant nitrogen supply, so fertilize them once a month from June through the first of September.

Ongoing Maintenance

After you get your strawberries in the ground and fertilized, immediately follow up with a deep mulch of straw, grass clippings or pine needles between plants. Mulching inhibits weeds, conserves moisture and helps keep fruit clean and roots cool. This is especially important for day-neutrals types.

Water your new planting thoroughly and try to keep the soil moist as the season progresses—consistent moisture is essential for strawberries' shallow roots, which need about 1 inch of water per week during the growing season. This is especially important in fall, when flower buds that will turn into next year's crop are forming. "The more cells that are formed in the flower bud, the larger the fruit will be," Bowling explains. Weed beds weekly, too.

During the first year, no matter what type of strawberries you choose to plant, the goal is to get your bed well-established. One way to help the plants settle in is to remove all flowers for the first four to six weeks. Doing this allows the plants to put their energy into developing healthy leaf canopies, root systems and runners, and, as a result, you can expect better yields in subsequent years.

If you are able to plant all three types, you will have day-neutrals and ever-



Strawberry shortcake and strawberry preserves are perennial favorites, and both are as easy to make as strawberries are to grow.



bearers producing berries the first year after their first flush of flowers has been removed. In subsequent seasons, you'll harvest approximately 1 to 2 quarts of berries per season, per linear foot of row. Ever-bearers bear the least, June-bearers bear the most intensely (all in about three weeks for a given variety) and day-neutrals the most (but over a long period of time).

Strawberry Fields Forever

If you want strawberry fields forever, renovate your beds after each harvest period. As a bed ages, the plants become crowded, berries become smaller and yields decline. To renovate the planting, use a shovel or tiller to narrow the rows to 6 to 12 inches, and then thin the remaining plants to about 4 to 5 inches apart, removing older and small, spindly plants whenever possible. Then, remove the old leaves by mowing the bed with the blade set high enough to avoid hitting the crowns.

June-bearers and ever-bearers managed this way should produce large berries for

at least five years. Day-neutrals will need to be replaced about every third year.

After renovation, give all of your strawberry beds a good weeding, and feed the remaining plants the equivalent of 5 pounds of 10-10-10 fertilizer per 100 feet of row. Renew mulch between plants and, where winters are severe, cover plants with loose straw in late fall.

Pests and Diseases

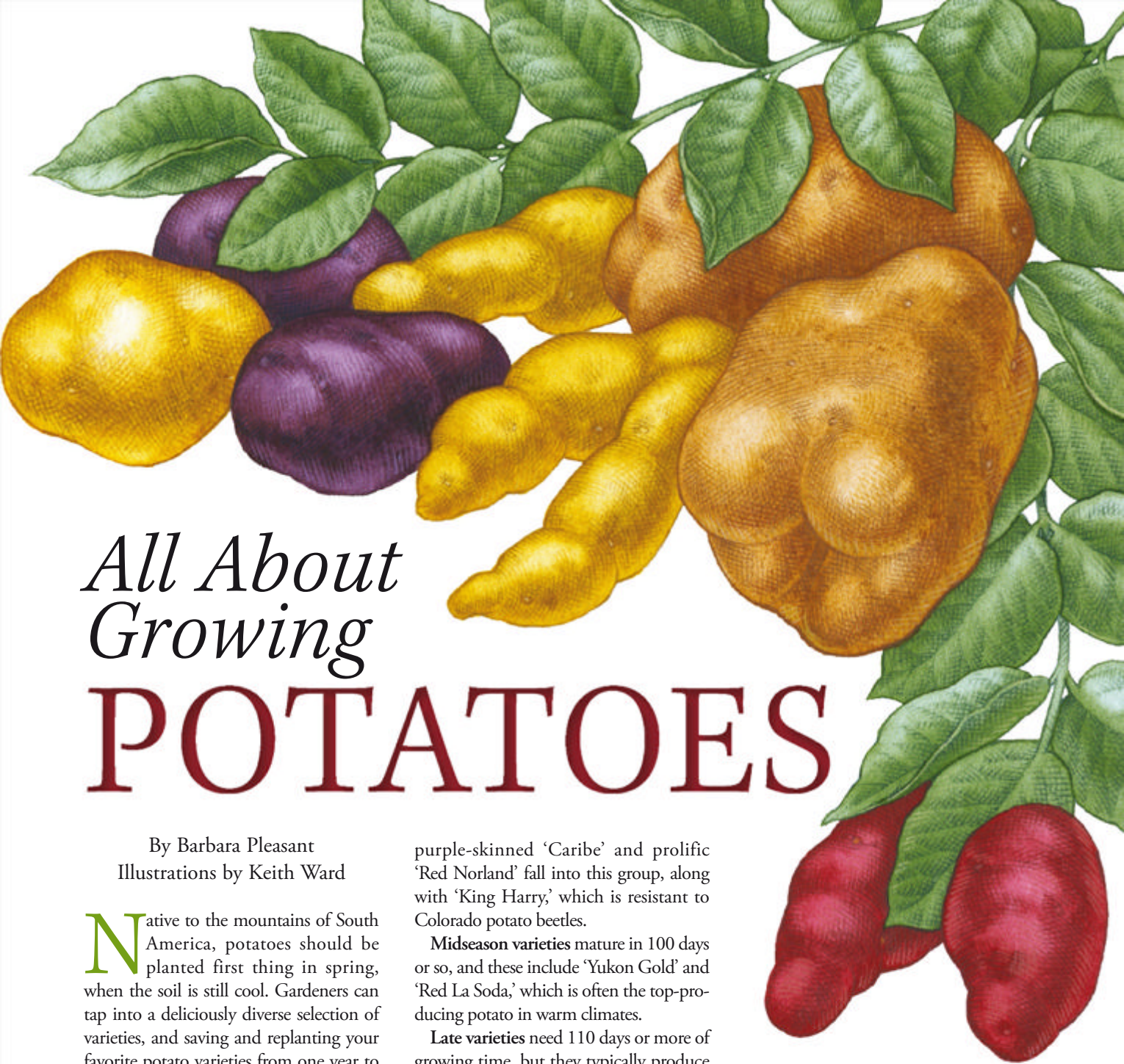
Most diseases that affect strawberries can be kept under control by choosing resistant varieties and practicing careful cultivation. When you pick, remove any spoiled fruits.

The major pests are usually birds (cover your ripening fruit with bird netting) and slugs or snails, which can be controlled by eliminating weeds, setting out beer traps, using a copper barrier strip around the bed's perimeter, or releasing decollate snails (*Rumina decollata*), a proven slug and snail predator sold in garden centers and nurseries and also available via mail order.

A few insects can be a problem with strawberries. These include the tarnished plant bug (a relative of the stink bug), the little black sap beetle and the strawberry clipper, but these insects are usually less troublesome to strawberries than birds, slugs and snails are. 🐛

Kris Wetherbee has tended strawberries for more than a decade in her home garden in western Oregon.





All About Growing POTATOES

By Barbara Pleasant
Illustrations by Keith Ward

Native to the mountains of South America, potatoes should be planted first thing in spring, when the soil is still cool. Gardeners can tap into a deliciously diverse selection of varieties, and saving and replanting your favorite potato varieties from one year to the next is easy.

Types to Try

Potatoes vary in size, shape, color, texture and time to maturity. Maturation time is the most important variable, because potato tubers grow best when soil temperatures are between 60 and 70 degrees Fahrenheit. No matter which type you plant, try to get your crop harvested before hot summer temperatures arrive.

Early varieties that mature in less than 90 days are a good fit for any garden. Creamy, round 'Irish Cobbler,'

purple-skinned 'Caribe' and prolific 'Red Norland' fall into this group, along with 'King Harry,' which is resistant to Colorado potato beetles.

Midseason varieties mature in 100 days or so, and these include 'Yukon Gold' and 'Red La Soda,' which is often the top-producing potato in warm climates.

Late varieties need 110 days or more of growing time, but they typically produce a heavy set of tubers that will keep well in storage. 'Butte' is an all-purpose brown-skinned potato that performs well in the Midwest; 'Katahdin' and 'Kennebec' rule in the Northeast.

Elongated fingerling potatoes vary in their maturation times and come in a range of colors and sizes. None are early, but late-maturing fingerlings will size up earlier if you pre-sprout the seed potatoes before you plant them.

(To shop for seed potatoes, go to www.MotherEarthNews.com/Custom-Seed-Search.)

When to Plant

In climates with short springs and hot summers, plant the early and midseason varieties three to four weeks before your last spring frost date. (You can find your last spring frost date online at <http://goo.gl/L9ed6>.) In climates with long springs and hot summers, plant early and midseason varieties three to four weeks before your last spring frost date; plant late-maturing varieties in early summer so they'll mature in the cooler days of fall. In climates with cool summers, plant early, midseason and late

In the Kitchen

Garden-fresh potatoes are a delicacy that you can pan-fry for breakfast, steam for a lunchtime salad, or serve roasted or mashed for a supreme comfort food. An excellent source of vitamin C and iron, potatoes also deliver a range of B vitamins and minerals. Everything goes with potatoes, but they pair particularly well with rosemary, onions and garlic, and with any type of roasted meat.



varieties two to three weeks before your last spring frost date.

How to Plant

Prepare the planting bed by loosening the soil to at least 10 inches deep. Potatoes adapt well to acidic soils that have a pH below 6.0, which is lower than the pH many other vegetable crops prefer. Thoroughly mix in a layer of compost or rotted leaves, along with a half-ration of alfalfa meal, soybean meal or another high-nitrogen organic fertilizer (follow the directions on the label). Do not use manure, as it has been correlated with an increase in rough patches on spud skins.

Two days before planting, cut the seed potatoes into pieces so that each piece has two to three buds (or “eyes”). Cutting the seed potatoes and letting the cut pieces dry for about two days will reduce the risk

of rotting. Work carefully if the eyes have already grown into sprouts. Allow the cut pieces to dry in a well-ventilated room. Plant the pieces 12 inches apart in 4-inch-deep furrows, and cover the seed pieces with 2 inches of soil. Fill in the furrows after the first sprouts emerge.

Harvesting and Storage

Potato plants will die back as they finish making their crop. Begin digging when the foliage starts to yellow and wither. Gently knock off dirt, and allow the tubers to dry indoors, covered with dry towels, for a day or two. Take care to protect the tubers from sunlight at all times to prevent greening that may result in bitterness. Store the best tubers in a cool, 50- to 60-degree place, such as a root cellar, to be used as seed potatoes. Eat the less-than-perfect potatoes first,

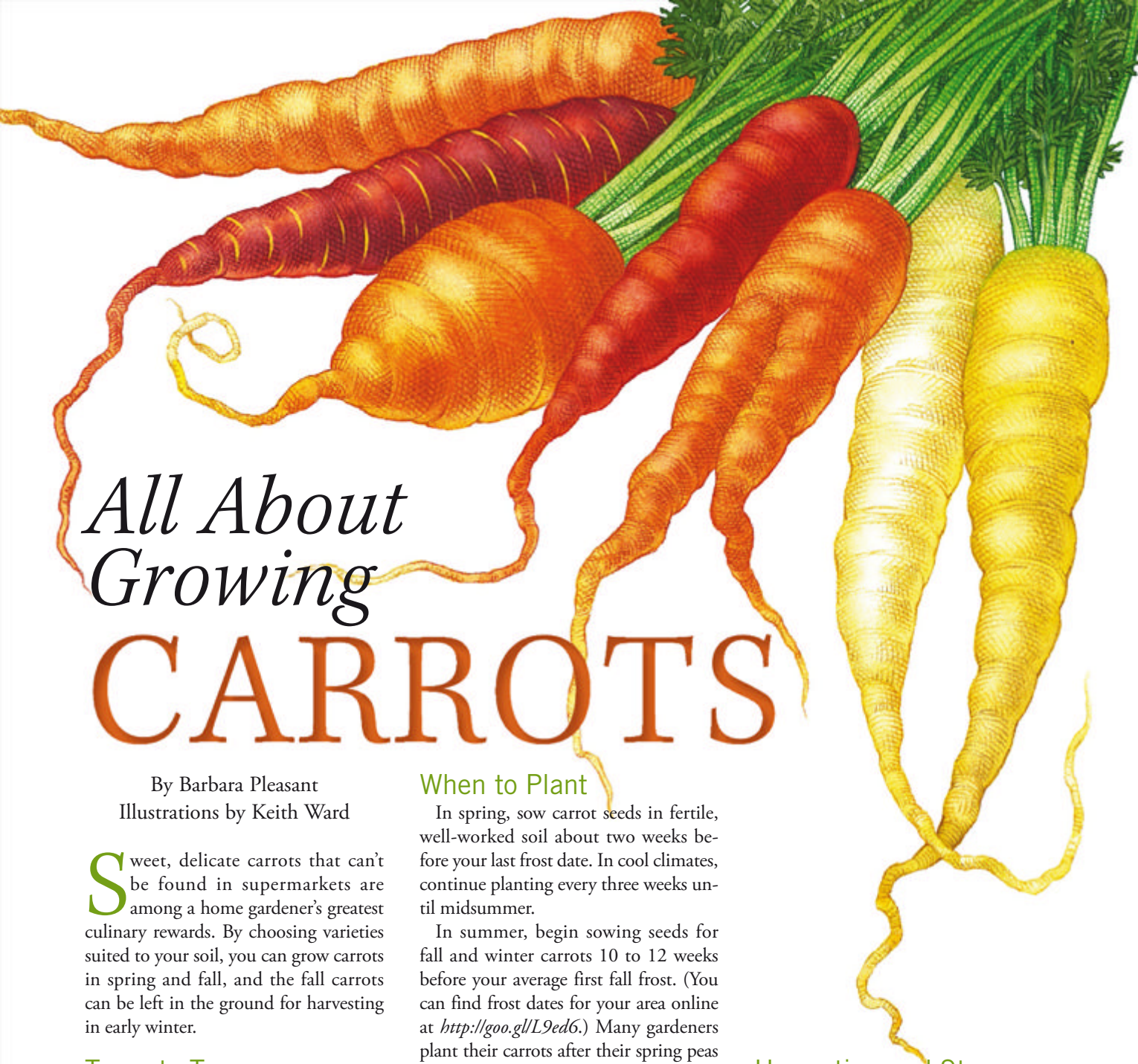
but keep in mind that they won't store forever. For longer storage, blanch and dry potato slices. If you plan to can any potatoes, you must use a pressure canner to do so safely. After harvesting the potatoes in the early stages of summer, plant the vacated space with beans or squash, or with a cover crop of buckwheat.

Saving Seeds

Plants occasionally produce true seeds, but they are easiest to propagate by replanting the actual potatoes. If you're a new gardener, start with certified disease-free seed potatoes. Set aside—and resist the urge to eat!—several pounds of perfect, medium-sized potatoes, as they will be great for planting the following year. You'll need about 6 pounds of seed potatoes to plant a 50-foot row, and yield will vary from 75 to 125 pounds. 🌱

Pest and Disease Prevention

Problem	Description	Controls
Colorado potato beetle <i>Leptinotarsa decemlineata</i>	Yellow-and-black-striped beetles lay orange eggs on leaf undersides. Brick-red larvae eat leaves and flowers.	Resistant varieties ('King Harry'); row covers; straw mulch; crop rotation; handpicking; spinosad.
Slugs and snails	Soft-bodied mollusks, with or without shells, chew holes in leaves at night or during rainy weather.	No evening watering; handpicking and trapping; encourage ground beetles and other natural predators with enhanced habitats; practice delayed or reduced mulching.
Flea beetles <i>Eptitrix cucumeris</i>	Tiny black beetles chew numerous small, round holes in leaves. Second generation may tunnel into tubers.	Tolerate light damage, or use spinosad to control serious infestations.
Scab <i>Streptomyces</i> species	Soilborne bacteria that cause corky patches to form on potato skins. Affected potatoes are good to eat, but less than beautiful.	Resistant varieties; rotate with unrelated crops; maintain constant soil moisture; do not use any kind of manure.
Early blight <i>Alternaria solani</i>	Widespread fungal disease that causes brown spots to form on leaves. Encouraged by wet weather and the presence of mature, failing plants.	Maintain wide spacing and use drip irrigation to keep leaves dry; harvest tubers before the disease becomes severe.
Late blight <i>Phytophthora infestans</i>	Devastating fungal disease encouraged by mild, wet weather. Causes leaves to wilt and turn brown within a few days.	Resistant varieties; early planting; wide spacing to help keep leaves dry.



All About Growing CARROTS

By Barbara Pleasant
Illustrations by Keith Ward

Sweet, delicate carrots that can't be found in supermarkets are among a home gardener's greatest culinary rewards. By choosing varieties suited to your soil, you can grow carrots in spring and fall, and the fall carrots can be left in the ground for harvesting in early winter.

Types to Try

Nantes are fast and easy to grow, producing straight, cylindrical roots, and they adapt to a range of climates.

Chantenay carrots develop stocky roots that become sweeter as the soil cools in fall.

Miniature carrots have small, shallow roots that are often quite sweet. They're good for heavy clay soil.

Imperator carrots are *long* and need deep, sandy soil to thrive.

Danvers carrots make great juice, and the sturdy roots store well, too. They grow well in cool climates.

When to Plant

In spring, sow carrot seeds in fertile, well-worked soil about two weeks before your last frost date. In cool climates, continue planting every three weeks until midsummer.

In summer, begin sowing seeds for fall and winter carrots 10 to 12 weeks before your average first fall frost. (You can find frost dates for your area online at <http://go.galL9ed6>.) Many gardeners plant their carrots after their spring peas are finished.

How to Plant

Prepare the planting bed by loosening the soil to at least 12 inches deep. Thoroughly mix in a 1-inch layer of mature compost or a half-inch layer of vermicompost (carrots love what earthworms leave behind).

Sow your seeds about a quarter-inch deep and 2 inches apart, in rows spaced at least 10 inches apart. Carrots do well in double or triple rows. Thin seedlings to 4 to 6 inches apart, depending on the variety's mature size.

Harvesting and Storage

Pull or dig spring-sown carrots when roots reach mature size and show rich color. Taste improves as carrots mature, but do not leave mature carrots in warm soil any longer than necessary (many critters like carrots). Summer-sown carrots that mature in cool fall soil can be left in the ground longer, but should be dug before the ground freezes to preserve their quality. Remove tops to prevent moisture loss, rinse clean, and store in a refrigerator or cold root cellar. Most varieties will keep for several months in the fridge. You may also can, pickle, dry or freeze your carrots.

Saving Seeds

Carrots are biennial and therefore won't flower and make seed until their second year. In cold climates, open-pollinated carrots kept in cold storage through winter can be replanted in early spring for seed production. After the seed clusters have ripened to brown, collect them in a paper bag, and then allow them to dry for another week indoors before crushing the clusters and gathering the seeds. Discard the smallest seeds. Store the largest seeds in a cool, dry place for up to three years.

Pest and Disease Prevention Tips

- Aster leafhoppers look like one-eighth-inch green slivers and hop about when foliage is disturbed. Leafhopper feeding causes only light damage, but leafhoppers can spread aster yellows, a disease caused by a tumor-forming bacterium sometimes present in otherwise healthy soils. Trying to eliminate it would be unwise because of its close family ties with nitrogen-fixing rhizobia that benefit legumes. Instead, grow carrots in compost-enriched soil far from grapes and fruit or nut trees, which often host

the parasitic bacteria. Use row covers to exclude the leafhoppers.

- Row covers will also protect a crop from carrot rust flies and carrot weevils, which make grooves and tunnels in carrots as they feed.
- Hairy or misshapen roots may be the result of excessive nitrogen or aster yellows disease.

Growing Tips

Keep the soil moist for at least 10 consecutive days after sowing, because carrots take longer to germinate than other vegetables. To reduce surface evaporation during the germination period, cover newly seeded soil with boards or old blankets for five to six days. Check daily, and remove the covers as soon as the first seeds germinate. Seeds germinate best when soil temperatures are between 60 and 70 degrees Fahrenheit.

Reduce weed competition by sowing carrot seeds in shallow furrows filled with weed-free potting soil. Cover the ground between rows with newspapers topped with a mulch of grass clippings.

Sow carrots with a "nurse crop" of radishes. The fast-growing radishes will

shelter tiny carrot seedlings while also helping to suppress weeds.

Be stingy with nitrogen. Among fertilizers, carrots favor compost or vermicompost worked into the soil before planting. They respond to abundant phosphorous and potassium more than they do to high nitrogen levels. Carrots take up nutrients best in soil with a pH between 5.8 and 7.0. Use lime to raise the pH of acidic soil.

Harvest carefully. Before pulling carrots, use a digging fork to loosen the soil just outside the row.

Harvest small blossom clusters from overwintered plants to use as cut flowers. Thinning the blossoms will help the plants channel energy to the biggest seed-bearing umbels (flower clusters springing from the same point).

Max out the season. To eat carrots year-round, grow fast-maturing varieties in spring, and make summer sowings for a season-stretching fall crop.

Use soaker hoses or drip irrigation lines to keep the soil constantly moist.

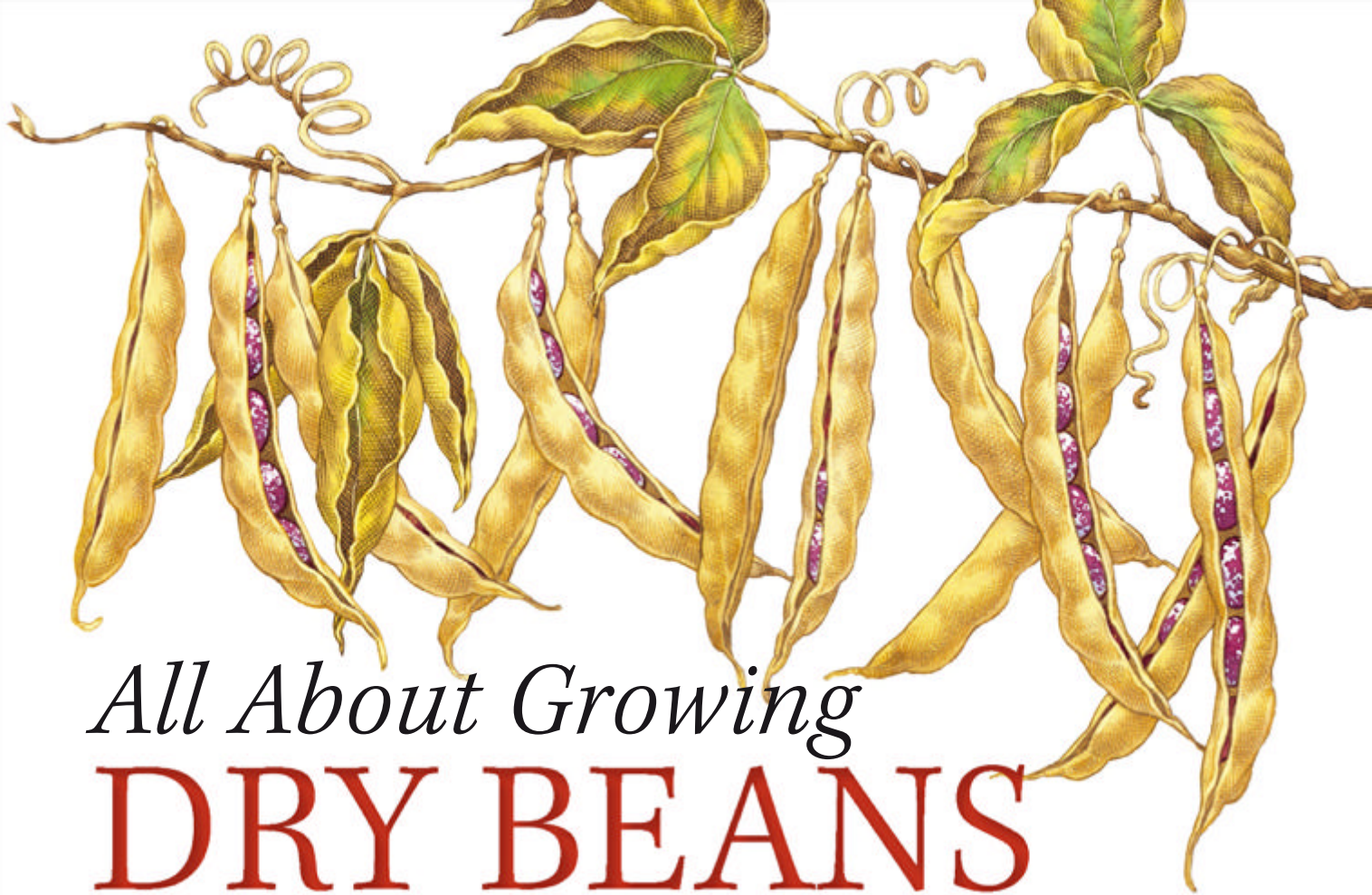
Cover the shoulders of all maturing carrots with mulch to prevent them from turning green. 🌱

Carrots at a Glance

Carrots last longest when stored between 32 and 45 degrees Fahrenheit.

Type	Description	Cultural Tips	Varieties
Nantes 55 to 70 days (spring) 60 to 75 days (fall)	Easy and widely adapted; straight, cylindrical roots 5 to 7 inches long; sweet flavor and crisp texture; limited storage potential.	Grow in loose, sandy soil or in raised beds enriched with plenty of organic matter, but no fresh manure.	'Early Nantes' 'Nelson' 'Mokum'
Chantenay 55 to 70 days (spring) 70 to 110 days (fall)	Conical roots with broad shoulders and rounded tips; rich, sweet flavor; good storage potential.	Good summer carrot, and not as picky about soil as other types. Try in clay soils with high organic matter content.	'Red Core' 'Kuttiger' 'Kuroda'
Miniature/baby 50 to 60 days (spring) 60 to 70 days (fall)	Cylindrical or tapered roots less than 5 inches long; crisp texture and quite sweet when mature; limited storage potential.	Grows in any fertile soil, including clay soils. Makes good "marker" plants to separate sowings of salad greens.	'Thumbelina' 'Little Finger' 'Parmex'
Imperator 55 to 100 days (spring) 80 to 110 days (fall)	Long, tapered roots with stocky shoulders and strong tops; slightly fibrous texture; stores well.	Roots size up best in deep, sandy loam. If pleased with their site, roots can become quite large.	'Yellowstone' 'Purple Haze' 'Sugarsnax'
Danvers 70 to 80 days (spring) 80 to 110 days (fall)	Thick-rooted, cylindrical shape, often with yellowish core; widely used in processing; good for juicing; stores well.	Grow in raised beds or in deep, sandy loam. Good main-crop type for cool climates.	'Danvers' 'Healthmaster' 'Danvers Half Long'

To find sources for these varieties, head to our Seed and Plant Finder at www.MotherEarthNews.com/Custom-Seed-Search.



All About Growing DRY BEANS AND PEAS

By Barbara Pleasant
Illustrations by Keith Ward

Dry beans and peas provide as much protein per serving as well-known protein powerhouses eggs and cottage cheese, with the added benefits of fiber and an array of minerals. You could eat the dry seeds from any green bean or pea, but certain bean and pea varieties grown for their higher yields of flavorful, nutrient-dense seeds would be a better use of your garden space. Many beans can be planted later than spring crops such as lettuce or peas, and this de-

layed planting means the pods will mature in the drier fall weather, when they'll be less likely to rot. Legume flowers attract beneficial insects, and because of legume plants' ability to obtain much of their nitrogen through partnerships with soil-dwelling bacteria, beans and peas remove fewer nutrients from the soil compared with most other crops.

Types to Try

Choosing legume varieties that suit your climate is key to a successful crop. Note that all dry bean and pea varieties can be harvested and cooked fresh as the seeds ap-

proach ripeness, or you can leave them to mature into their dry, easy-to-store form.

Soup peas (*Pisum sativum*) are a cool-weather crop cultivated like green shell peas, but starchy soup peas are smooth instead of wrinkled. These frost-tolerant peas should be planted quite early, in cool spring weather. Bush-type varieties, such as 'Gold Harvest,' form self-supporting blocks if grown in wide beds, but 'Blue Pod Capucijners' and other tall varieties will need a sturdy trellis. Soup peas grow best in cool northern climates, in slightly acidic to neutral soil with a pH from 5.5 to 7.0.



Bean varieties, from left to right: 'Streamline,' 'Christmas,' 'Yin Yang,' 'Dwarf Horticultural' and 'Pinkeye Purple Hull.' Top: 'Good Mother Stallard.'

In the Kitchen

Dry beans and peas share an impressive nutritional profile: A 1-cup serving of cooked, dry legumes will provide about 15 grams of protein, plus lots of manganese, fiber, B vitamins and iron. Rinse dry beans well in cool water before cooking. If using a pressure cooker, cook the rinsed beans for 15 to 30 minutes. If you plan to cook dry beans on the stovetop, soak them in room-temperature water for 6 to 12 hours, depending on their size. Drain, then cook at a low simmer for 2 to 3 hours. Season slow-cooked beans generously with garlic, bay leaf or thyme. Cooked beans can be simmered for a warm soup or chili, marinated for salads, puréed into dips or spreads, or mashed for filling burritos or enchiladas.



Traditional dry beans (*Phaseolus vulgaris*) look and grow like green snap beans, but the pods quickly become too tough and stringy to eat. Bush-type New England heirlooms, including ‘Kenealy Yellow Eye’ and ‘Jacob’s Cattle,’ tolerate cool soil conditions, so they are the best beans to grow where summers are short and cool. In warmer areas, bushy, black-and-white ‘Yin Yang’ (also known as ‘Calypso’) beans are as dependable as they are pretty. ‘Dwarf Horticultural’ beans can be sown after spring crops in areas with long summers. These and other true dry beans grow best in near-neutral soil with a pH between 6.5 and 7.0.

Many gardeners prefer to grow pole-type dry beans, which are grown up trellises or sown among knee-high sweet corn or sunflowers. Heirloom long-vined varieties—including intricately marked, brown-and-white ‘Hidatsa Shield’ and maroon-and-white ‘Good Mother Stallard’—will eagerly scramble over drying corn in many climates. Where summer nights are warm and humid, ‘Turkey Crow’ and ‘Mayflower’ make outstanding cornfield beans provided they reach maturity in dry fall weather.

Runner beans (*Phaseolus coccineus*) produce sweeter immature pods compared with those of other dry beans, and the plants’ showy flowers entice bumblebees. Runner beans benefit from cool nights, and they’re easier to grow than lima beans in moderate climates. The dry seeds are big, colorful and meaty, resembling lima beans but possessing a sweeter flavor. ‘Scarlet Emperor’ bears purple-and-black

seeds. The seeds of peach-blossomed ‘Sunset’ are almost entirely black, while those of ‘Streamline’ are speckled black and brown. Runner beans prefer soil with a near-neutral pH between 6.0 and 7.0.

Lima beans (*Phaseolus lunatus*) thrive in warm, humid weather and are often resistant to pests that bother regular beans. Pole-type varieties, including ‘Christmas’ (‘Large Speckled Calico’) and ‘King of the Garden,’ can return huge yields if supplied with a secure trellis. Bushy ‘Jackson Wonder’ can be grown as a dry bean, too. Dried limas are easier to shell than tender green ones. Lima beans favor slightly acidic soil with a pH between 5.8 and 6.5.

You can store dry beans and peas well into winter for hearty meals.

Cowpeas or crowder peas (*Vigna unguiculata*), collectively known as “Southern peas” or “field peas,” originated in Africa and have retained their need for warm weather. Glossy cowpea leaves are of no interest to common bean pests, and the purple blossoms set fruit even in humid heat, making this crop ideal for areas with hot, humid summers. ‘Early Scarlet’ and other bushy varieties set their pods high, which allows for easy picking, but you’ll get more peas per square foot via semi-vining varieties, such as ‘Pinkeye Purple Hull,’ ‘Mississippi Silver’ brown crowder and ‘Peking Black’ crowder. Small-seeded, almost-white ‘Zipper Cream’ is much-loved for its creamy culi-

nary attributes and grows in a bush form. Cowpeas grow best in slightly acidic soil with a pH between 5.5 and 6.5.

Tepary beans (*Phaseolus acutifolius*) are native to the Southwest and Mexico, where they have been part of the traditional diet for thousands of years. Tepary beans are planted during the summer rainy season. They have smaller leaves than regular beans do, and they adapt well to the alkaline soils found in many arid climates. Tolerant of heat and drought, tepary beans can produce well in any climate that has plenty of late-summer warmth and limited humidity. White-seeded ‘Tohono O’odham White’ and more colorful ‘Blue Speckled’ make excellent low-care crops in areas with hot summers. Tepary beans grow best in a neutral to alkaline soil with a pH near 7.0.

When to Plant

In early spring, sow soup peas in fertile beds four to six weeks before your last frost. All other dry beans and peas are warm-weather crops best sown in late spring and summer. Sow these seeds in fertile soil starting no earlier than two weeks after your last frost date. In areas with long summers, later plantings made in June may have the advantage of ripening during the typically dry weather of early fall, when scant rain reduces the likelihood of pods rotting. In any climate, traditional dry beans with a bush habit can be planted up to 90 days before your first fall frost date.

Harvesting and Storage

Harvest beans and peas for drying after the pods have become leathery up to

when they have dried to their mature colors. (For example, the pods of 'Dwarf Horticultural' beans turn ivory with red stripes when the seeds inside have reached maturity, while those of 'Pinkeye Purple Hull' cowpeas turn dark purple.) You can harvest green beans and peas for fresh cooking sooner, but seeds you intend to store must be fully ripe.

Leave drying pods on the plants as long as you can, but harvest them before a period of prolonged rain. If damp weather sets in just when your beans should be drying, pull up the plants and hang them upside down in a dry place until the beans are dry enough to pick and sort. Collect drying pods from pole varieties and runner beans as they change to tan or brown, and let the pods dry until crisp in a shallow tray or box kept indoors.

Threshing, or "shelling," is the process of removing bean seeds from the pods, and you can do it either by machine or by hand. On a home-garden scale, shell a large crop of dry beans or peas by placing the dry pods on a tarp and walking over them to crush them. Gather the heavy seeds that drop from the pods, and remove debris by pouring the beans back and forth from one bowl to another in front of a fan for a few minutes. Another option for small harvests is to put the pods in a pillowcase, tie the pillowcase closed tightly, and tumble it in a warm (not hot) clothes dryer.

After shelling and winnowing out debris, place your beans or peas in open bowls, and let them dry at room temperature for two weeks, stirring often. When the seeds are hard and glossy, remove any shriveled beans (dumping the beans over a screen can help), and store your sorted beans in airtight containers. If you suspect bean weevils or other insects may be present in your stored beans or peas, keep the sealed containers in the freezer.

Saving Seeds

Select the largest, most perfect seeds from your stored beans to keep with your



Mexican bean beetles darken in color as they age.

cache of garden seeds for replanting. Because the seeds of legumes are self-pollinating, varieties are not likely to cross if varieties of the same species aren't grown side by side. When stored in an airtight container in a cool, dark place, dry bean and pea seeds will remain viable for at least four years.

Pests and Diseases

Brick-colored, black-spotted Mexican bean beetles often lay clusters of yellow eggs on leaves of *P. vulgaris* beans, and the eggs then hatch into yellow larvae that will rasp tissues from leaves. Handpick this pest in all life stages, and try spraying neem on the insects and the leaves

they're eating to control light infestations. In large plantings of more than a quarter-acre, try releasing beneficial *Pediobius* wasps. Mexican bean beetles do not bother cowpeas and are only slightly keen on limas.

Night-feeding cutworms sometimes fell bean seedlings by severing them at the soil line. Diatomaceous earth (DE) sprinkled over the soil's surface can help reduce such losses.

Wait until foliage is dry to pick or weed beans, because bean rust and other leaf-spot diseases can spread among plants when the leaves are wet.

Dry beans and peas are naturally short-lived plants. Promptly pull up and compost any plants that are past their prime in order to interrupt the life cycles of pests and diseases. 🌱

GROW MORE!

Find comprehensive growing guides for dozens of other vegetables and fruits at www.MotherEarthNews.com/Crops-At-A-Glance.

How to Plant Legumes

Loosen well-drained soil to at least 12 inches deep. Mix in a 1-inch layer of mature compost and, if you have it, a spadeful of soil from a bed where the same species of beans or peas grew the year before (to help inoculate the soil with nitrogen-fixing bacteria). Plant seeds 1 inch deep and 3 inches apart. Do not thin soup peas, as these grow best when crowded. Thin bush beans to 4 to 6 inches apart; thin pole beans, limas and semi-vining cowpeas to 10 inches apart. Dry beans and peas bear all at once on spreading branches, so they need wider spacing than snap beans do.

When growing dry beans up cornstalks or sunflowers, wait until the support crop is 18 inches tall, and plant bean seeds on the sunniest side of the corn or sunflowers. As the support crop topples from the weight of the beans, you may need to install stakes to give wandering vines a place to twine. Four- or 5-foot-tall stakes placed every 2 feet in rows of semi-vining cowpeas will help support and boost the productivity of the plants, which often reach 4 feet tall. Pole-type lima beans are a full-season crop, and they require a sturdy trellis that's at least 6 feet tall.



Support vining bean varieties with poles, stakes or tall plants, such as sunflowers.

ADDITIONAL RESOURCES

Recommended Books

You can order many of these great books online at www.MotherEarthNews.com/Shopping.

All New Square Foot Gardening
by Mel Bartholomew

The All You Can Eat Gardening Handbook: Easy Organic Vegetables and Money in Your Pocket
by Cam Mather

The Big Book of Preserving the Harvest
by Carol W. Costenbader

The Bountiful Container
by Rose Marie Nichols McGee and Maggie Stuckey

The Complete Compost Gardening Guide
by Barbara Pleasant and Deborah L. Martin

Edible Landscaping
by Rosalind Creasy

Four-Season Harvest
by Eliot Coleman and Barbara Damrosch

Garden Insects of North America
by Whitney Cranshaw

The Garden Primer
by Barbara Damrosch

Garden Wisdom and Know-How
by Editors of Rodale Books

The Gardener's Bug Book
by Barbara Pleasant

Gardening When It Counts
by Steve Solomon

Greenhouse Gardener's Companion
by Shane Smith

Heirloom Vegetable Gardening: A Master Gardener's Guide to Planting, Seed Saving, and Cultural History
by William Woys Weaver;
available on CD-ROM

Landscaping with Fruit
by Lee Reich

The Organic Farming Manual
by Ann Larkin Hansen

Recipes from the Root Cellar
by Andrea Chesman

Root Cellaring
by Mike and Nancy Bubel

Small-Scale Grain Raising
by Gene Logsdon

The Solar Food Dryer
by Eben Fodor

Starter Vegetable Gardens
by Barbara Pleasant

Storey's Guide to Raising Chickens
by Gail Damerow

The Winter Harvest Handbook
by Eliot Coleman

Garden Advice and Planning

www.MotherEarthNews.com/Better-Garden-Soil
Tons of information about healthy soil, compost and organic fertilizer.

www.MotherEarthNews.com/Crops-At-A-Glance
This guide will walk you through the specifics of growing 51 garden favorites, including recommended varieties.

www.MotherEarthNews.com/Garden-Know-How
A collection of organic gardening advice that covers everything from the introductory basics to advanced techniques.

www.MotherEarthNews.com/Garden-Planner
Design your best garden ever with the help of our easy-to-use, interactive Vegetable Garden Planner. Try it free for 30 days!

www.MotherEarthNews.com/Organic-Gardening
Learn how to use natural methods to grow fresh food and productive crops, sans toxic chemicals. Find featured Organic Gardening articles, Ask Our Experts entries and the Organic Gardening Archive.

www.MotherEarthNews.com/Organic-Gardening-Products
A custom search tool to help you find advice about organic methods of pest control and locate the products you need.

www.MotherEarthNews.com/Pest-Control-Series
Resources for pest identification and organic control methods.

www.MotherEarthNews.com/Season-Extension
Our best plans for greenhouses, hoop houses, cold frames and more season-stretching gear.

www.MotherEarthNews.com/What-To-Plant
Get precise planting dates for 30 garden crops based on the average last spring frost date in your region.

AmpleHarvest.org
www.AmpleHarvest.org
Extra produce? This site helps home gardeners donate extra food to a local food pantry.

LocalHarvest
www.LocalHarvest.org
An excellent directory to help you locate local food and farmers.

Seed Sources

www.MotherEarthNews.com/Custom-Seed-Search
A custom search tool to help you locate sources for the fruit and veggie varieties you want to grow.

www.MotherEarthNews.com/High-Quality-Seeds
Experts explain seed genetics and the seed industry, and give recommendations for locally adapted seed companies.

Seed Companies
The following companies have at least 25 percent organic offerings, and many have signed the Safe Seed Pledge:

Baker Creek Heirloom Seed Co.
417-924-8917
www.RareSeeds.com

Fedco Seeds
207-426-9900
www.FedcoSeeds.com

Filaree Garlic Farm
509-422-6940
www.FilareeFarm.com

High Mowing Organic Seeds
802-472-6174
www.HighMowingSeeds.com

Horizon Herbs
541-846-6704
www.HorizonHerbs.com

Irish Eyes Garden Seeds
509-933-7150
www.IrishEyesGardenSeeds.com

Johnny's Selected Seeds
877-564-6697
www.JohnnySeeds.com

Mountain Valley Growers
559-338-2775
www.MountainValleyGrowers.com

Natural Gardening Co.
707-766-9303
www.NaturalGardening.com

Renee's Garden Online Catalog
888-880-7228
www.ReneesGarden.com

Seed Savers Exchange
563-382-5990
www.SeedSavers.org

Seeds of Change
888-762-7333
www.SeedsOfChange.com

Seeds Trust
720-335-3436
www.SeedsTrust.com

Select Seeds
800-684-0395
www.SelectSeeds.com

Southern Exposure Seed Exchange
540-894-9480
www.SouthernExposure.com

Terroir Seeds
888-878-5247
www.UnderwoodGardens.com

TomatoFest
www.TomatoFest.com

Turtle Tree Seed
518-329-3037
www.TurtleTreeSeed.org

Gardening Tools & Supplies

American Garden Tool Co.
www.AmericanGardenTools.com

ARBICO Organics
800-827-2847
www.Arbico-Organics.com

Earth Tools
502-484-3988
www.EarthToolsBCS.com

Florian Tools
860-628-9643
www.FlorianTools.com

Gardener's Supply Co.
888-833-1412
www.Gardeners.com

Green Heron Tools
610-844-5232
www.GreenHeronTools.com

Hoss Tools
229-769-3999
www.HossTools.com

Lee Valley Tools
800-267-8735
www.LeeValley.com

Meadow Creature
360-329-2250
www.MeadowCreature.com

Peaceful Valley Farm & Garden Supply
888-784-1722
www.GrowOrganic.com

Red Pig Garden Tools
503-663-9404
www.RedPigTools.com

Rogue Hoe
417-962-5091
www.RogueHoe.com

Greenhouses

Garden Greenhouse Kits and Supplies
www.MotherEarthNews.com/Greenhouse-Supplies

Information and Advice on Home Garden Greenhouses
www.MotherEarthNews.com/Home-Garden-Greenhouse-Advice

FarmTek
www.FarmTek.com
Supplies greenhouse, cold frame and high tunnel supplies for season-extension projects.

Food Preservation

www.MotherEarthNews.com/Canning
Everything you need to start canning, from recommended books and supply sources to a list of canning recipes.

Lehman's
800-438-5346
www.Lehmans.com
Carries a variety of supplies for canning and preserving foods, as well as other homesteading equipment and tools.

National Center for Home Food Preservation
www.UGA.edu/nchfp
Offers current research-based recommendations for food preservation methods, along with tested recipes.

Pressure Cooker Outlet
800-251-8824
www.PressureCooker-Outlet.com
Features name-brand pressure cookers and pressure canners, and also carries parts for pressure cookers.

Organic Farming & Market Growing

Farmers Market Coalition
www.FarmersMarketCoalition.org
Offers lots of great news and resources for market farmers.

Growing for Market
www.GrowingForMarket.com
A publication for small-scale, ecological market farmers.

NCAT National Sustainable Agriculture Information Service
www.ATTRA.org
The latest information on sustainable agriculture and organic farming, including news, events and funding opportunities.

Sustainable Agriculture Research and Education (SARE)
www.SARE.org
A leading source of advice and resources on sustainable agriculture practices.

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